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Journal of Forestry

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Editorial

Making Watershed Management More Effective

FROM THE beginning of forestry in the United States, watershed protection has been a determining factor in forest administration, and large areas of land have been entrusted to foresters for management in order to safeguard watershed values. The men of our profession have taken this trust seriously, even when it has led to the difficult task of defending public welfare against private interests.

In spite of obstacles, much progress has been made; yet right now the problems of watershed protection and management are more challenging than ever. Floods, sediment, and erosion have become a major issue. Water shortages are widespread, even in the more humid parts of the country. At the same time demands for timber, grass, and other products of the land are increasing in pressure. Often conflicting, these divergent needs call for the most carefully planned and executed management, based on a thorough knowledge of the important relationships between vegetation, water, and soil.

As a professional group, foresters take pride in understanding these relationships and assign them a major role in dealing with watersheds. There may be some reason to question, however, whether we are successful in translating our understanding into sound and effective management on the ground. If so, it is appropriate to examine current practices in an effort to see where they are lacking and how they may be improved.

Although this discussion deals mainly with forest land, we can also consider the grass- and brush-covered watersheds which are commonly administered by foresters as well as range specialists. Watershed problems on many of these areas reached an acute stage within recent years, and special attention has been focussed on the development of sound practices for management and restoration. Although much remains to be done, current procedures are generally pointed in the right direction. Range management technicians have learned considerable about the relations of vegetation to runoff and soil stability, and are putting this knowledge into constructive action in regulating grazing use. When attacks have been made on the management and even the ownership of these lands, technicians have had a volume of evidence in favor of such regulated and conservative use as a means of watershed protection. And the forestry profession as a whole has supported these men in making their recommendations effective.

On timber-covered land foresters have also taken long steps toward good watershed management. Forest areas throughout the country have been put under regulated use after decades of over-cutting, grazing, and burning. Thorough fire protection on private and public land, coupled with reductions in cutting and grazing, have helped to stop erosion, reduce floods, and rebuild the forest stand.

Perhaps as a result of this work, however, some of us have assumed that good forestry is generally good watershed management, and have neglected to watch for conditions in which the two kinds of management are not compatible. When foresters start handling overmature stands, for example, their first desire is to put the forest into more productive condition by timber cutting. The resulting use of the land commonly fails to account for watershed needs; trees are cut and roads developed with insufficient regard for the effects on water and soil. Wherever the erosion potential is high this means trouble, with soil loss and site deterioration.

As it happens, timber removal can form a valuable part of watershed management where erosion hazards are relatively low and water values are high. But it has not often been planned that way; ordinarily the current use is based on the

needs for harvesting timber or supplying the local sawmill.

Departures from optimum practices occur in the other direction too. Sometimes watershed specialists try to protect forested watersheds to an unnecessary degree, at a high cost to both public and private interests. Recent plans, for example, have called for the extensive reforestation of old burned areas at high altitudes, for the nominal purpose of watershed protection. Yet research and experience have shown that such areas usually present minor flood problems and are good water producers in their present grass-covered condition; and that planting them with trees for timber production is unprofitable. On other watersheds, arguments have been made for the complete protection of well-forested and stable land because of high water values, even though examination has shown that regulated timber removal would benefit both water and wood production.

There is evidently some conflict in our ideas and practices. Some lean toward management of the timber resource alone, while others let watershed restoration problems influence their judgment in making management plans for all lands. Perhaps this is because foresters are going through a transition period in the problems of land management. Up to now our major job has been to start organizing the use of forest land and restoring deteriorated stands to more productive and stable condition. But now it is becoming necessary to do our management in more precise terms, taking the relative needs of various land resources into more quantitative consideration.

When this problem is solved, the forestry profession will have gained a thorough and general recognition of the effects of forest land management on watershed values. The results of increased research and pilot-plant work will be available, so that qualitative principles can be turned progressively into quantitative recommendations. Moreover, the forestry profession will include a number of trained specialists in watershed management—many more than the few we have now. These men and silviculturists together will know to what extent timber growing and harvesting have an impact on watershed conditions, and will advise land managers how far to go in removing timber as well as in protection and reforestation. For effective application of these recommendations, every forester who takes part in land management will have some background of college and field training in watershed management, like their present training in forest management.

When these objectives are reached, when foresters generally understand the implications of their work in land management and handle forested watersheds soundly for other purposes as well as wood production, then we shall be putting watershed management into fully effective practice, reaping maximum benefits from the resources of our land.

H. G. WILM.

Answering the Threat of Forest Depletion[1]

J. P. Weyerhaeuser, Jr.

President, Weyerhaeuser Timber Company, Tacoma, Wash.

THOSE WHO insist America is heading down a one-way trail to forest oblivion obviously haven't bothered to check all the facts. Certainly they have not examined the prevailing trends in modern industrial forestry. The basic concept of the timber operator has long since changed from one of migratory trade and temporary holdings to one of permanence based on long range planning and scientific land operation. Our modern economy, rather than posing a growing threat to forest resources, is, for the first time, providing the economic incentive to grow trees as a crop.

The realization that timber is renewable was slow in developing. Tree farming and treating timber as a crop became practical only after it became profitable. Until it became a probability that trees could be grown to realize more than the costs of growing, few were interested. Until sometime after the great depression of 1932, one could purchase more trees whenever needed at less than the cost of growing them.

Our 345 million acres of private forestlands capable of producing a commerical crop represent over four million different ownerships. Our 116 million acres of similar publicly owned forestland contain a large percentage (43 percent) of the present inventory of mature timber, but are by and large less capable of growing a large annual crop of timber than the more accessible and fertile private lands. The forest products industry, which owns 84 million acres out of this total of 461 million acres of commercial timberland in the country, depends for its existence upon the renewal and wise use of all these lands. Industry's own lands are being treated with increasing care for regrowth, as evidenced by the employment in industry of more than 2,000 forestry school graduates at this writing. Wood-using industries' statement of policy increasingly stress the importance of timber cropping. The following is the opening sentence of the "Program of Forest Conservation" officially adopted by the national lumber industry:

"Nothing is more important today to the enlightened self interest of our wood-using industries and the principal groups of wood consumers than to assure an adequate and stable supply of raw materials within the United States."

Constructive work in this direction has been done by an industry agency called American Forest Products Industries. Its "Tree Farm Program" has spread the tree farm movement from a single beginning in the State of Washington in 1941 by our company to 23 states of the union, where there are 1,750 organized tree farms covering 17,648,813 acres. Its current "Trees for America Program" is aimed at persuading the more than four million small owners of 261 million acres of commercial forestland that they have a paramount and financially profitable interest in managing their forestland on a crop basis, much as other cropped lands are managed. At the present rate of organization, American Forest Products Industries, Inc., which sponsors these programs in behalf of lumber, pulp, and paper industries, expects to have 30,000,000 acres in organized, carefully supervised tree farms by 1951.

These are well-managed forest properties devoted to continuous production of forest crops, supervised and organized by foresters employed by conservation committees of lumber, pulp, and paper associations, state forestry organizations, established forestry and conservation associations, and encouraged by Chambers of Commerce and various service organizations. They are supported by the individual efforts of forestland owners and contributions for overhead from industrial groups and state boards of forestry. The cost to the taxpayer is negligible; yet notable results are being obtained.

The "Keep Green Program" is another grass roots program similarly sponsored. It also originated in the State of Washington in 1940, and has now spread to 25 states. It functions on a statewide basis and works through county or local committees made up of public spirited citizens from all walks of life. All work is done on a voluntary basis, except for a state director and office services. A.F.P.I. furnishes literature and posters and helps with the original organization in each state. Statewide budgets have been from

[1]Presented at a round table discussion on the subject, "Our Renewable Resources Can be Sustained," at the 37th annual meeting of the United States Chamber of Commerce, held in Washington, D. C., May 4, 1949.

$5,000 to $25,000 a year, contributed from all sorts of sources. Results have been good. For example, the admittedly good fire year 1948 in the State of Washington produced only 255 forest fires on state and private lands, as against a 20-year average of 958 fires. Only 4,400 acres were burned, whereas the 20-year average was 58,532 acres. The reduction in fire weather gets some of the credit, but fire consciousness of the general public has made a tremendous difference. The public needs to be constantly reminded of the danger, since it pretty generally appropriates the hunting and fishing rights no matter who the record owner.

Newest of A.F.P.I.'s national forestry programs is "More Trees for America." Three states—Alabama, Virginia, and New Hampshire—launched "More Trees" projects in 1948 and a fourth state, Washington, started its "Cash Crops" program only last month. Other states will follow suit as soon as effective arrangements can be made.

These "More Trees" projects are grass roots educational programs aimed primarily at farm woodlot owners. The initial interest-arousing phase is followed by on the ground demonstrations in which technical foresters show landowners how to manage their woodlands as tree farms. During the course of a "More Trees" program, practically every small timberland owner in the state is contacted and offered an opportunity to participate.

Booklets, filmstrips, moving picture trailers, and newspaper advertising are prepared by A.F.P.I. and supplied to the individual participating states. A.F.P.I.'s publication *Cash Crops From Your Woodlands* has been used in all the "More Trees" programs launched to date and has been read by thousands of farmers.

In addition to these projects nationally sponsored by A.F.P.I., there are other significant accomplishments in a number of the states. In Wisconsin, "Trees for Tomorrow," an organization sponsored by paper and pulp companies, is planting thousands of acres to young trees and working with the youth of the state in promoting conservation for use. The West Virginia Forestry Council, initiated by forest products industries and composed of many groups interested in forestry, has made a notable record during its two years of existence. New Jersey, Virginia, and other progressive states are giving widespread, practical help to small owners. The southern states expect to increase their state nurseries' output of trees for planting from 150 million to 370 million during 1949. This is just a sketch of the spontaneous state and private contribution to our forestry progress. It should not be underemphasized.

Reference to hundreds of millions of acres and millions of owners calls attention to the fact that appraisal of our forest inventory and its use is such a Gargantuan task that no one feels equal to it except government. All parties to an argument about America's forests perforce go to the U. S. Forest Service for factual data.

We must recognize that since its organization under Gifford Pinchot the Forest Service itself has almost continuously "viewed the situation with alarm." It was predicted in 1907, for instance, that the southern pineries would be cut out by 1920, though the 1944 resurvey found in the 11 southern states 323 billion board feet of sawtimber and an annual growth amounting to nearly 20 billion board feet. In 1919 the chief of the Forest Service predicted that should another war emergency arise by 1934 we would have very great embarrassment in obtaining even the lumber needed for general construction. Yet the record of war supply was remarkable and not limited by the timber supply.

Interpretation of Forest Service data often seems to us in industry to lean toward the thesis that the public must be frightened into acceptance of the big, all-powerful "Let's pass a law" federal approach, offering subsidies and incentives in one hand and threats of federal regulation in the other. This means more and more taxes, and more thousands of federal employees who would render ostensibly free services not only on forestry, but also on how to conduct our businesses. House Bill 2223 now before Congress illustrates the concept by providing increased authorization for the Forest Service at the rate of $23,500,000 a year to make possible three to four thousand new federal employees.

We are all agreed on growing more trees for America. Recent years have seen great strides in that direction. Not the least of the actuating forces has been that same rise in value of prime forest material which many of us have viewed askance. The use of lower valued, though more expensively handled, material has been accelerated by the rise in stumpage values. Industry's technological improvements have made possible the transmutation of small and previously unmarketable pieces or species of wood into pulp for paper, board, or chemical uses. A wide mar-

ket for the trees we are all growing will continue to be of utmost importance to forestry.

Out in the West, we are just beginning to find markets for those so-called "wastes" for which the industry has been criticized. No one is going to legislate those markets for us. Hard work in product development and sales as the result of self-interest will produce them. The necessary investment risks also will be taken if the business climate permits, but not via the "crack-the-whip" method. Neither can the millions of forestland owners be so actuated.

Our modern economy is providing a background leading to voluntary renewal of our timber resources, and, instead of being a threat, it furnishes the greatest assurance that these resources will both be renewed and used for the greatest benefit of all the people.

Sprouting in Cork Oak

AN INTERESTING example of vigorous sprouting of cork oak (*Quercus suber*) seedling roots occurred during the past year at the State Forest Nursery at Davis, Calif.

Acorns collected in the fall of 1947 were placed in a long, outdoor seedbed in December that year and germinated normally in from two to three months. Following the usual practice the seedlings were dug as rapidly as possible in the spring and transplanted to gallon cans for growth in the lath house during the year. This digging is accomplished with a sharp spade used horizontally at a depth of four to six inches below the surface of the bed. This cuts the tap-root of the seedlings at about that depth and the lower portion of the roots was thus left in the ground. Some of these root segments were probably six to ten inches long as the downward growth from the acorn is very rapid in the early stages. After all seedlings were transplanted the bed was left untouched for the rest of the season.

In about a month the first shoots from the severed roots appeared above ground and by midsummer the bed was virtually filled with cork oaks, grown entirely from this source. These sprouts grew more slowly than the seedlings which have the benefit of the attached acorn, and the leaves were generally of smaller size than in normal seedlings. Nevertheless these shoots grew with considerable vigor during the year and at the end of the season showed an average height of about 18 inches. When dug recently they show that the shoots came from the top of the severed roots at four to six inches below ground level and except for this leafless extension of stem below ground they look like normal cork oak seedlings.

Some of the resprouts were transplanted to gallon cans early in the year where they made slow growth but developed into quite normal looking trees except for the smaller leaves.

The bed is being left to see if additional sprouting will occur following the second cutting of the roots.

WOODBRIDGE METCALF,
University of California.

Public Forest Regulation[1]

Earle H. Clapp

Former associate chief of the Forest Service, U. S. Department of Agriculture, 1935-1944; and acting chief, 1940-1942.

IN SPEAKING to this conference, on the public regulation of forest practices on private lands, I can't avoid a sense of pinch hitting for another man. He was a life long advocate of public regulation, and the conference is infinitely the poorer because he cannot talk to you today. Those of you who knew him can easily imagine the zest and force he would have brought to the subject. It is wholly unnecessary to tell you that I speak of Gifford Pinchot.

Public regulation has been a battle ground in the United States off and on for many years. This conference affords the opportunity to take a new and fresh look at the whole question. Fortunately for this purpose, the Forest Service has recently published a reappraisal of our forest situation based on the best data ever available. But beyond that, we must take seriously into account great social and economic changes that have been taking place in the United States and in our relationship to the rest of the world.

Time limitations permit the discussion of only those aspects of the forest problem that bear directly on the why, and what, and who or what agency, of public regulation.

Why Public Regulation

The first aspect of the forest problem, that should be made clear in any consideration of why public regulation is necessary, is the size of private ownership. Exclusive of lands most valuable for purposes other than timber growing, its total of 345 million acres includes most of our best forest land. It is ¾ths of all our forest land suitable and available for growing timber. From it we have been taking about 90 percent of our total timber cut.

The second aspect is that more than 75 million acres of our forest land is poorly stocked with seedlings and saplings, or is wholly denuded. Most of the rest came into public ownership after the forest had been wrecked. Only a few countries in the world possess as much forest land.

The third, and a more complex aspect, is the supply of timber large enough for sawlogs. This so-called sawtimber, which takes the longest to grow, makes up 80 percent of the timber we cut and destroy.

All of our very considerable progress in forest conservation has not been enough to reverse the downward trend in our sawtimber supplies. During the past forty years, for the entire country, they have been falling on the average by about 1.3 percent annually. Without drastic action continued drop is inevitable. The trend could not be different when the current drain on sawtimber exceeds replacement by new growth by about half.

In the ¾ths of all our commercial forest area east of the Plains, which is very largely in private ownership, the existing stands now average only about 3.5 thousand board feet per acre, a fraction of what they once were. Almost half of the forest area of the North bears only seedlings or saplings, or is wholly devastated. The entire East now has little more than half the sawtimber, or growing stock, needed to produce its share of a national production goal.

To bring the sawtimber problem into sharper focus, how can we double the growing stock in the East, in the face of demands that will almost certainly reduce it? Of course we have the old growth stands in the West, with nearly half of our remaining sawtimber. But too many of them are either poor or remote. And there aren't enough of them. This then is the crux of our forest problem; the increasingly serious shortage of sawtimber growing stock—the growing stock without which we can't grow the largest and most essential part of our future timber requirements.

The fourth aspect is the status of forest practices on private lands. Present practices have resulted chiefly from fifty years of public effort, and of very substantial financial help. Despite rather marked recent improvement, 2/3rds of the cutting is still poor or destructive, and only 8 percent is up to really good standards. Under the still more exacting criterion of forest management, which includes cutting practices and fire protection, only one percent of our privately owned forests are under intensive management.

[1]Presented at the National Emergency Conference on Resources, held in Washington, D. C., on May 12, 1949.

An additional 4 percent is under good extensive management; that is, with good cutting practices and at least fair fire protection. More than $^3/_4$ths of all private forest land is either without management or is nonoperating. Small owners have made the poorest showing.

Existing private cutting practices and forest management obviously fall far below what is needed to maintain the existing sawtimber growing stock; much less to build it up as we must to meet future timber requirements.

No reference so far has been made to the extreme difficulty we had to supply requirements for forest products during the recent war emergency. Or to reconstruction when lumber has been priced beyond the reach of most low and middle income people. No reference has been made to the numerous other services that forests should render, most important among them the protection of watersheds.

No reference has been made to the contribution that productive forests can make to labor, to stable and diversified rural industries, and to the support of local units of government. All of these merge into still broader social and economic questions. Vitally important is the federal and state legislation of the past few years looking toward social insurance, full employment, agricultural supports, and the maintainance of high and rising standards of living, national production, and national income. Serious efforts are being made to extend and broaden these measures. Emergence of the United States from World War II as one of the two great world powers has brought inescapable and almost world-wide obligations. To underwrite these programs we must have a base of abundant natural resources, including forests. Otherwise we shall be seriously handicapped or fail.

The case for public action rests, then, on the enormous acreage of private land. On the major contribution it makes to our timber requirements. On the necessity for preventing further forest destruction. On the crucial problem of reversing the steady downward trend in our sawtimber. On the need for a drastic and nationwide improvement in private forest practices. And on an expanding social and economic program, both national and international in its objectives.

The American people, like all others, have constituted government, to do for them collectively the jobs they have been unable to do for themselves individually. The public through its government has only two forms of action available, fully and promptly, to safeguard its own interest in privately owned forests. They are public regulation and public ownership.

The past fifty years, the future outlook, show that the United States, like all other nations that have achieved a nation-wide forest system, has no other choice than a combination of public regulation and public ownership, or complete public ownership.

The only solution for present-day America is the combination. Public regulation should be supplemented with various forms of public cooperation. Outright public ownership is the only sound and lasting solution for a much larger part of our forest land. The time has come when we can no longer afford to temporize. We can provide future forests in abundance only by prompt and bold public action.

What Regulation—The Minimum Standards

Much time has been devoted to the "why" of public regulation, partly because a sound analysis should clearly indicate what regulation is needed, or what minimum standards of forest practice should be set. Taken as a whole, changed and changing conditions fully justify higher minimum standards than would have been reasonable and necessary fifteen or even ten, years ago. They justify much greater emphasis on cutting practices and growing stocks. To fulfill its purpose, remedial action must strike at the root of the problem.

The minimum requirements should have three objectives:

First, stop further forest destruction.

Second, require good cutting practices.

Third, and all important, reverse the national downward trend of our sawtimber growing stock and build it up.

Good cutting practices should leave the land in possession of desirable species in condition for vigorous growth in the immediate future.

The national growing stock objective should take full advantage of the surplus stocks in the West to help overcome the deficit in the East. While building up stocks in the East, it should prevent reduction below a desirable minimum in the West.

All these objectives require the greatest emphasis on selective cutting, which removes only

the larger and more mature trees and leaves the smaller trees for future growth. They require emphasis on frequent and light cuttings rather than infrequent heavy cuttings. They require the prohibition of cuttings in immature stands. They require the protection of young and small trees in logging. And they require the fullest cooperation of all private owners with public agencies in fire and other protection.

Extreme measures will be necessary to insure the right kind of selective cuttings. For the large number of small owners dependent for a meager livelihood upon current returns from their forests, Secretary Brannan's recently announced plan for agriculture may offer the solution. If not, some other must be found.

Clearcutting, and clearcutting in its modified form of leaving only a bare minimum of seed trees, must be reduced to an absolute minimum. It should be authorized only where compelling silvicultural conditions demand it, and obviously be coupled with replanting where necessary. The burden of proof always should be on any owner who wants to clearcut.

It goes without saying that the need for watershed protection on timber growing and other private forest lands should be taken fully into account. Destructive grazing should be controlled.

Because for most forest land, we shall have to start from scratch, it may be necessary to set initial minimum standards somewhat lower than would be desirable. The ideal can hardly be reached overnight. This will call for an escalator clause in the regulatory legislation which will authorize and direct the raising of minimum standards periodically until the desirable level is reached.

Additional requirements for effective public regulation include a clearcut legislative outline of the principles on which the minimum requirements should be based. For the formulation under this basic outline, of rules of practice adapted to local forest types and conditions, and having the force of law. For the modification of the rules when necessary. For the classification of the land so that all owners will know where regulation applies. For adequate trained personnel, and a decentralized and effectively supervised administrative setup. For ample advice and assistance to forest owners. For adequate penalties for violations, including injunctions to stop cutting, etc. And for the full use of democratic processes such as advisory boards, public hearings, appeals, etc., short of jeopardizing the purposes of the law itself.

Who or What Agency Should Do The Regulating?

The last major question for consideration, but by no means the least, is who, or what agency, should do the regulating?

Unorganized self-regulation by the owners of forest land has reduced our forest to its present condition. It has created our forest problem. While self-regulation organized under public auspices might be a little better, it hardly deserves serious consideration.

Three criteria will serve to contrast the relative merits of federal and state regulation, two much discussed plans.

The effectiveness of regulation will depend, first, on the basic legislation.

While as yet we have no federal regulatory legislation, it is almost certain to be better than state. It should be at least as good as the best state laws, better than the average, and far better than the worst. Congress would almost certainly consider the problem realistically from the national standpoint. On technical questions it would almost certainly rely heavily on the recommendations of the Department of Agriculture. These have always been higher than those proposed by the states.

The character of state regulatory laws can be judged by those already enacted by some 15 states. No one measures up to the standard proposed by the Department of Agriculture. Some provide for little more than aid and advice. Others merely legalize forest destruction. Several make inflexible and rather low seed tree requirements. Many lack adequate provision for violations, and some make none. While some of the more recent laws are marked improvements over earlier enactments, their chief contribution will be to reduce forest destruction. The net effect on the most critical problem of the further reduction of the sawtimber growing stock will be very small. The best that can be hoped for under state legislation will be an uneven coverage, with conspicuous gaps.

The effectiveness of regulation will depend, secondly, on the enforcement of the legislation.

Here again we can reasonably count on federal enforcement at least as good as in the best

states, better than in the average, and far better than in the poorest.

One example of what can be expected from the federal government is the administration of cutting by private operators in the national forests. The cut now totals several billion board feet annually. The results in forest practices are outstanding for the entire United States.

State enforcement of existing regulatory laws ranges down from sincere and reasonably effective efforts to enforce inadequate laws to nothing at all. Some states have made no appropriations for enforcement. The laws in others are too recent to judge results.

Federal enforcement personnel will be protected by a strong Civil Service. Federal recruiting standards will certainly average higher, and tenure will be much more certain. In some states the personnel is subject to sweeping changes with every change in administration, even in the same party. A federal organization will be much less subject to seizure by the interests regulated, and less susceptible to pressures for lower standards. The federal government can put onto the job a much larger and stronger nucleus of men with long experience in the control of cutting operations in all parts of the United States. Federal enforcement will be reasonably uniform for the entire country. That by the states will range from good down to poor, or be lacking entirely.

Results in the forest are the third criterion. It seems reasonable to conclude that better legislation and better enforcement will give federal regulation a clearcut advantage over state.

On the whole, public forest regulation is probably the biggest and most difficult conservation job so far contemplated in the United States. It is no less than to get several million owners of 345 million acres of forest land, in forty or more states, to do something that many of them have never done before, and many of them don't want to do, and in the process to make them like it.

If the job is national in its area and distribution of forests, it is still more so in the number and distribution of the users of forest products, and of other direct and indirect beneficiaries of the forest. That includes every inhabitant of the United States. Every navigable and power and water-supply stream of importance is involved. The job is increasingly national in all its social and economic and international implications. It is increasingly urgent. In the long run it will be costly.

It's only horse sense to turn the biggest, most difficult, most urgent, and national, forest conservation job over to the *one* strongest, best-equipped, national organization we have; not to forty or more weaker and less well-equipped state organizations. Our national history is replete with examples in which we have had to do just that.

One of the plans proposed for public regulation would combine federal and state. The states would be given the opportunity to do the job with federal financial assistance. The federal government would take over only if the states fell down, or did not undertake it. The plan would have some of the advantages of federal regulation, and some of the weaknesses of state. Results would probably fall somewhere between those for outright federal and outright state.

So, all things considered, my conclusion is that if the people of the United States really want the forest conservation job done, they will have to turn to the federal government for one of the most important and difficult phases of it, that of public regulation. It won't come easily. Federal regulation, as yet, has too few friends and advocates. I hope that this conference will greatly increase the number.

The New Bradley Transplanter

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MOUNTING labor costs have forced nurserymen to mechanize their operations. An important step in this direction was taken about ten years ago with the development by Hildebrand of a 2-row self-propelled transplanter (JOUR. FORESTRY 41:476). This machine, known as the Holland transplanter, is now standard equipment in many forest tree nurseries. It transplants two rows of seedlings per round. By running back and forth for six rounds, it transplants two 6-row nursery beds with a spacing of 8 inches between rows of seedlings.

Recently, nursery trade publications have carried announcements of a 5-row transplanter manufactured by the Harry A. Lowther Company, Joliet, Ill. This new development is of interest to foresters because the original model was designed and built by a forester—Tom O. Bradley, nursery manager, Soil Conservation Service Nursery, Zanesville, Ohio. Some notes on the background of this development and its adaptability to forest tree nurseries will be welcomed by foresters raising nursery stock which requires transplanting.

After using the Holland transplanter for two years, Bradley recognized that, next to the labor-saving feature, its biggest contribution was the good job it did in setting the seedlings. Therefore, if he could develop a more powerful tractor assembly which would permit using five planting units instead of two, he could (1) improve spacing in the transplant rows, (2) eliminate some of the frequent turns around the end of the beds, and (3) speed up transplanting operations at lower cost.

He set to work on this project in the winter of 1946-1947. The construction of a frame to carry the planting units and the crew was not difficult. His biggest problem was to find sufficient power which could be slowed down to a speed of not to exceed 10 feet per minute. Because the planting units are hand-fed, no faster speed could be used, but no standard tractors could be operated so slowly.

With the assistance of a local machine shop, however, Bradley overcame the speed difficulties by rebuilding an old E-68 caterpillar type Cletrac. The tractor frame was extended 17 inches in front and the motor moved forward. In the space thus provided, a Chevrolet transmission was installed between the "moved-forward" motor and the regular Cletrac transmission. The Chevrolet transmission has a ratio of 1 to 1 in high gear and approximately 7 to 1 in creeper gear. By using the low gears of both transmissions the extremely low speed needed was obtained. For road speed to and from the fields and for turning at the ends of beds, the forward transmission (Chevrolet) is placed in high and the rear or regular Cletrac transmission is used for whatever power or speed is desired. Still another advantage is that the unit can be operated in reverse gear for maneuvering in and out of equipment sheds and for quickly lining up at the start of each bed.

This transplanting unit, consisting of the 5-row transplanter rig pulled by the remodeled tractor, was first used at the Zanesville Soil Conservation Service nursery in the spring of 1947. Throughout the planting season the average number of seedlings transplanted per hour was a little more than 8,500, by a crew of five planters, one to feed each unit, and a tractor operator who acted as foreman. Additional workers were of course needed for digging, grading, and supplying the planter with seedlings.

In the winter of 1947-1948 a similar machine was constructed for the Soil Conservation Service nursery at Winona, Minn. Thor K. Bergh, manager at that nursery, reported an average of 10,000 seedlings planted per hour, the increase over Zanesville's operations being due to the much lighter, sandier soil at Winona.

In the fall of 1948 the construction of another machine was undertaken at Zanesville for operation in the spring of 1949. With two units Bradley expects to cut his total transplanting job of about 2,300,000 trees to a 3-week period, and at the same time make a major saving in transplanting costs.

In addition to the equipment described, both nurseries using the Bradley transplanter have provided weatherproof coverings for the planters. These covers accomplish several important purposes: they protect the seedlings from drying out, and shelter the transplant crew against the cold winds so prevalent in the early spring. With the shelter it also is possible to operate

FIG. 1.—The rebuilt tractor with a supplemental transmission and the covered transplanter. The covering permits work in bad weather and protection to the seedlings.

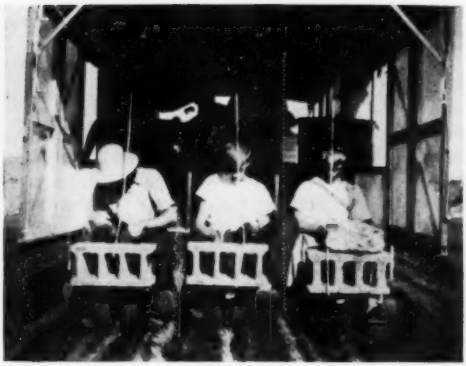

FIG. 2.—Rear view of the 5-row transplanter. Operators threading the two forward units cannot be seen. Concrete blocks of varying weights insure uniform planting depth.

the machine during light rains particularly when transplanting on sandy soils.

As presently designed, the Bradley transplanter sets a 5-row bed with a row spacing of 11 inches. Although this does not give the bed density that can be accomplished with transplant boards, the wider spaced 5-row bed has certain advantages. The operation is faster, cheaper, and the regularity of the row spacing permits mechanical cultivation with tractor equipment. Such cultivation equipment can be attached to the transplanting frame in place of the transplant units.

Another scheme that has been tested for operation in 1949 at Winona involves the use of the new rear engine Model G Allis Chalmers tractor as a cultivator. The advantage of this equipment is that instead of pulling the tillage tools from behind where they cannot be seen, the Allis Chalmers G tractor permits full vision of the cultivating tools.

Many nurserymen in the Midwest have observed the Bradley transplanter in operation and are enthusiastic about it. The bottleneck in the construction of such a machine is the tractor. The prewar model E-68 Cletrac, now supplanted by a new postwar model, is one of the few tractors whose frame design lends itself to the adaptations made by Bradley. These alterations do not, however, prevent use of the tractor for regular work as two men can remove the speed reduction unit and reassemble the tractor to its normal operating condition in about four hours.

Harry Lowther, president of the company bearing his name, recognized the importance of this power unit in getting the multiple row transplanter into commercial production. In the fall of 1948, he put his engineers and Harold J. O'Brien, a former S.C.S. nursery employee, to work on his current model. The Lowther machine has a self-contained tractor unit rather than a "slowed down" caterpillar tractor used in the original Bradley machine. Foresters will be interested in the results of the field trials of the Lowther machine. If it operates as successfully as Bradley's original unit, foresters can look forward to better transplant stock, produced at cheaper cost.

The Suitability of Second-Growth Douglas-Fir Logs for Veneer

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Veneer-cutting tests at the U. S. Forest Products Laboratory indicate that most of the veneer cut from second-growth Douglas-fir logs of rapid, moderately rapid, or relatively slow growth is not suitable for use as face veneer in the production of plywood by current methods and standards. The many knots present a serious problem, and the relatively wide annual rings result in veneer that does not have the fine texture desirable for faces.

It was found to be advantageous to heat veneer blocks in order to prevent undue looseness of veneer, promote smoothness, and enable cutting the knots without nicking the knife. Veneer of rapidly grown wood, especially that containing many knots, buckled as it dried. Most of the knots fell out, and the veneer split excessively.

If the industry is to use second-growth Douglas-fir for face veneer, better quality logs are obviously needed. Overlay materials intended to mask such defects as small knots and splits thus far have had strictly limited application. Fundamentally, the problem of producing Douglas-fir timber yielding high-grade veneer logs is a silvicultural one calling for pruning and growth-rate control of selected trees.

As SUPPLIES of large old-growth Douglas-fir logs used for veneer become depleted, the suitability of smaller, rapidly grown second-growth logs for veneer production takes on a new significance. Even though the Douglas-fir plywood industry adapts itself to the use of other species and branches out into other regions for its log supply, its future will ultimately depend upon its ability to utilize second-growth Douglas-fir.

The most prominent characteristic of currently available second-growth Douglas-fir logs, as compared to old-growth logs, is their smaller size. In many ways these small second-growth logs, often 2 feet or less in diameter, are similar to the inner 2-foot portions of old-growth logs. As every veneer man knows, these portions of old-growth logs often yield veneer containing many knots and displaying a coarse grain figure because of their rapid growth.

To determine the suitability of typical second-growth Douglas-fir logs for use in the manufacture of veneer and plywood,[1] a series of veneer-cutting tests was made at the Forest Products Laboratory.

Description of Logs Used

The logs used in the study were selected near Oakridge, Lane County, Oregon, on the Willamette National Forest. Trees of three age groups were represented: a 70-year age group that had grown rapidly on site II, a 100-year age group grown on site II, and a 150-year age group grown rather slowly on site IV.[2] Three 18-foot butt logs from each age group were included, each log supplying three 4-foot bolts (except two in the 70-year age group that supplied one bolt each). A total of 23 bolts were cut into veneer.

All bolts were reasonably round and concentric. All bolts were very knotty, regardless of the age class and the fact that all bolts came from 18-foot butt logs. Each 4-foot bolt contained from one to three whorls of knots, and some of these knots appeared on the surface of every bolt. Some of the trees had grown extremely rapidly at an early age; those in the 70-year age group at the rate of three or 4 rings per inch in early life. The logs are described in greater detail in Table 1.

Experimental Procedure

The bolts were divided into three groups for rotary cutting at different temperatures. Each group contained some bolts from each age class. The first group was cut at room temperature without previous heat treatment, just as most Douglas-fir veneer is now cut commercially. The second group was heated in water at 210° F. until all of the wood to be cut had come to a temperature of at least 190° F. The third group was heated in water at 160° F. until all of the wood to be cut had come to at least 140° F.

Most of the veneer cut was $^1/_{16}$ and $\frac{1}{8}$ inch thick, but a small amount of $^3/_{16}$- and $\frac{1}{4}$-inch

[1] This study was part of a larger laboratory study of the utilization possibilities of second-growth Douglas-fir. The study was under the general direction of Arthur Koehler and B. H. Paul, who selected the logs and collected the basic silvicultural data concerning them. The Pacific Northwest Forest Experiment Station assisted in getting out the logs.

[2] Site-quality classes in the Douglas-fir region are designated as I, II, III, IV, and V, according to average heights of 200, 170, 140, 110, and 80 feet, respectively, of dominant trees at 100 years of age.

material was also cut. During the cutting, care was taken to adjust the lathe settings properly to obtain the best possible cutting. A rigid bar, ground to a 15° angle, was used. Most of the bolts were cut to a core diameter of approximately 6 inches.

The veneer was clipped into sheets 29 inches wide and dried in a roller-conveyor type of mechanical veneer dryer. Temperatures used for drying were 250° and 325° F., the latter being the upper limit of the machine. The moisture content after drying averaged about 2 percent, with a maximum of 5 percent.

Records were kept of the various lathe and dryer settings, of the defects encountered in the logs and in the veneer, of the shrinkage occurring during drying, of veneer yields, and of other important factors.

Results of Veneer Cutting

No difficulty was encountered in adjusting the lathe knife and pressure bar for optimum cutting quality. It was found that these settings were no more critical with the second-growth bolts, regardless of age or temperature, than with old-growth logs.

The effect of the temperature of the wood was nevertheless pronounced in other respects. Veneer cut from the unheated blocks was very loose, containing many pronounced lathe checks. This looseness could not be eliminated entirely by adjustment of lathe settings, but was much less pronounced in the veneer cut from blocks heated at 160° F.; slight additional improvement in tightness was attained in the veneer cut from blocks heated at 210° F.

Veneer cut from unheated blocks was also very rough. This roughness occurred most commonly in bolts or sections of bolts that had grown very rapidly, and generally was most pronounced in areas where there was only a thin layer of soft springwood over a band of dense summerwood. Less roughness occurred in veneer cut from blocks heated at 160° F. In veneer cut from blocks heated at 210° F. little additional improvement was attained in this respect, but the veneer was generally very fuzzy because of overheating.

Knots encountered in the unheated blocks often nicked and sometimes chipped the lathe knife, which was of medium temper, ground to a 21° angle. This resulted in roughly cut veneer even though frequent stops were made to hone the knife. The knife was not damaged when cutting the heated bolts because the knots had been softened sufficiently to cut readily. It is possible, of course, that a specially tempered and ground knife would cut the knots in the unheated bolts without being damaged. A certain amount of roughness also appeared in the vicinity of knot whorls because of the sloping grain encountered.

Veneer Drying

The time required to dry the second-growth, heartwood veneer of various thicknesses at 250° and 325° F. in a mechanical dryer was comparable to the drying time required for old-growth Douglas-fir veneer at the same temperatures. Tangential or widthwise shrinkage during drying to an average moisture content of about 2 percent ranged from 4.08 to 8.56 percent, and averaged 5.30 percent.

No pronounced difficulty was encountered in drying the veneer cut from bolts in the 150-year age group. Small splits present in the veneer before drying did not lengthen significantly during drying. Sheets with a large number of knots

TABLE 1.—DESCRIPTION OF LOGS FROM WHICH VENEER BOLTS WERE TAKEN

Log No.	Age group	Site quality	Age of tree (stump high)	Average diameter at small end of smallest bolt	Number of rings per inch		Average width of sapwood	Average moisture content		Average specific gravity	
					Near pith	Near bark		Sapwood	Heartwood	Sapwood	Heartwood
	Years		*Years*	*Inches*			*Inches*	*Percent*	*Percent*		
41	70	II	71	21¼	3	14	1½				
42	70	II	51	17¾	4	8	2½	128.8	33.7	0.429	0.445
43	70	II	66	28½	3	9	2¾				
16	100	II	107	22	5	23	2				
17	100	II	102	22¾	4	22	1½	121.5	34.5	.538	.453
18	100	II	99	20½	5	24	1¾				
34	150	IV	155	19¾	6	21	1¾				
35	150	IV	151	16½	7	34	2	95.6	32.5	.529	.523
36	150	IV	151	16¾	6	40	¾				

and the accompanying short grain showed a slight tendency to buckle.

Veneer cut from bolts of the 100-year age group buckled considerably on drying. Some splitting accompanied this buckling. The ends of the sheets tended to be wavy. Knots also caused buckling of the sheets because of the sloping grain that surrounded them.

Veneer cut from bolts of the 70-year age group buckled excessively during drying. Many splits occurred in the areas that were badly buckled. End splitting was also much worse than in the other veneer. The $^1/_{16}$-inch veneer buckled more than the thicker veneer.

The chief reason for the buckling and waviness seemed to be the relatively great width of the annual rings. Since the rings in the central portions of the logs were wider than the thickness of the $^1/_{16}$- and $^1/_8$-inch veneer, certain areas were predominantly either springwood or summerwood. Since springwood differs from summerwood in density, shrinkage characteristics, and other respects, a certain amount of buckling is inevitable.

Most of the knots, being dead, fell out during the drying. The many loose knots may cause trouble in a multiple-deck mechanical dryer because they fall from veneer in the upper decks onto the veneer below and may be pressed into the veneer, leaving deep, lasting indentations.

Veneer Yields and Quality

Gross veneer yields obtained from the bolts cut were relatively low, being only about 83 percent of the board-foot lumber scale of the logs (International scale). The gross veneer yield is based on the total volume of dry veneer obtained, before deducting for defects, and measured on a board-foot basis, 1 board foot of veneer being 1 foot square and a full inch thick. This yield figure cannot be considered very reliable because of the small volume of logs cut. Furthermore losses frequently occur in experimental work because of stops to change thicknesses, rounding up to make lathe adjustments, breakage, and other accidental losses in cutting and handling.

More important and perhaps more reliable data were obtained on the quality of the veneer produced. Since knots constituted the most numerous and most pronounced defects, a special tabulation of them was prepared and is summarized in table 2. The table shows how the veneer sheets from trees of the three age-groups are distributed in classes that have various numbers of knots. Veneer cut from logs of the 150-year age group had the largest number of knots, 61.3 percent having more than 20 knots per 4- by 4-foot square. These knots, however, were much smaller than those occurring in veneer from the more rapidly grown logs. Fewer knots occurred in the more rapidly grown logs, because the branch whorls were farther apart.

Table 2 is useful in determining just how much patching would have to be done to obtain a certain percentage of sound veneer. For example, 6.0 percent of the veneer (all age classes) had up to four knots in a 4- by 4-foot sheet that required patching in order to make sound veneer; 11.1 percent had from 5 to 8 knots requiring patching. Therefore, up to 8 knots per 4- by 4-foot sheet would have to be patched to make only 17 percent of the veneer sound. It would appear that 4- by 8-foot sheets of veneer would therefore have up to 16 knots requiring patching to make 17 percent of them sound. This estimate is perhaps low, for as the length of the veneer bolts increases the chances of obtaining large sheets of veneer with few knots throughout their length become less.

The importance of this problem was brought out even more emphatically in a study of knots occurring in second-growth Douglas-fir logs.[3]

[3] Paul, B. H. Knots in Second-growth Douglas-fir. Forest Products Lab. report No. 1690. November, 1947.

TABLE 2.—KNOTS OCCURRING IN 4- BY 4-FOOT SECOND-GROWTH DOUGLAS-FIR VENEERS[1]

Age class of trees *Years*	Percentage of sheets containing					
	Up to 4 knots	5 to 8 knots	9 to 12 knots	13 to 16 knots	17 to 20 knots	More than 20 knots
70	5.0	10.9	16.4	18.3	13.6	35.8
100	7.2	15.3	15.2	22.1	10.6	29.6
150	5.6	6.1	7.2	9.2	10.6	61.3
All classes	6.0	11.1	12.8	17.2	11.5	41.4

[1] Data were originally gathered on veneer sheets of various thicknesses having a green size of approximately 29 by 51½ inches, then adjusted to uniform thickness and to 4- by 4-foot dry dimensions.

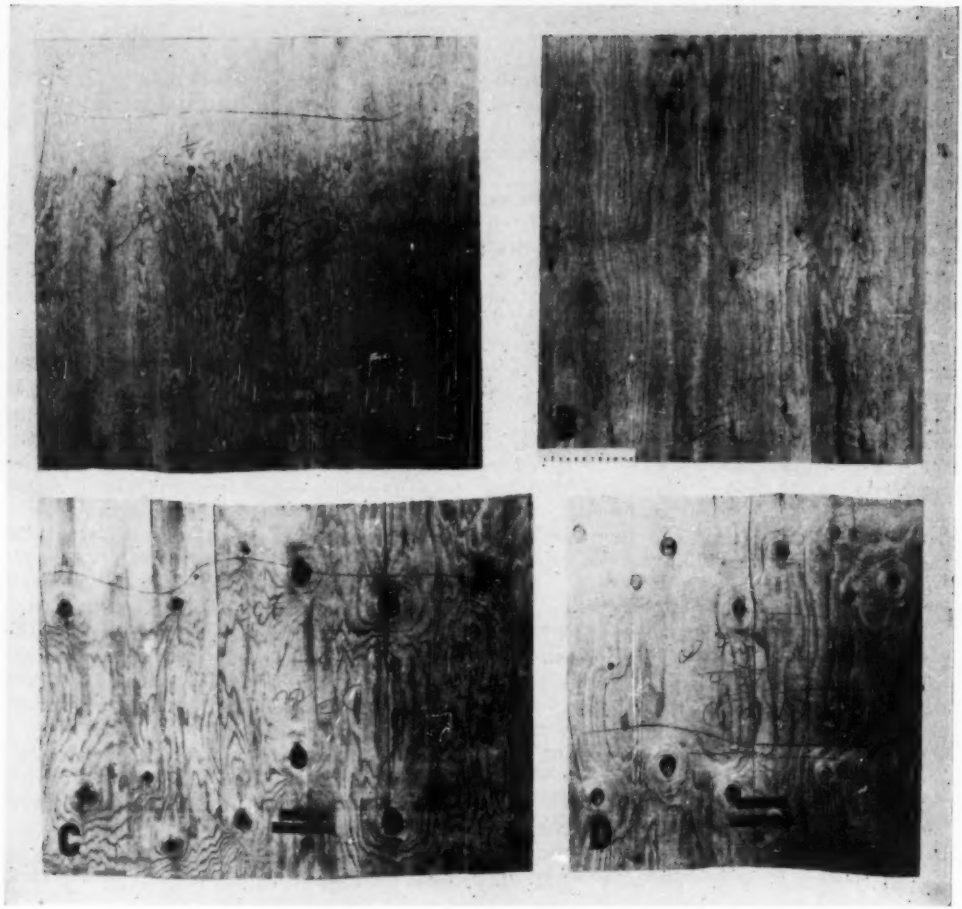

FIG. 1.—Second-growth fir veneer displaying various grain patterns related to the rate of growth in rings per inch: A=20, B=11 to 12, C=9 to 10, and D=5. Each sheet represents one complete revolution around the bolt. A was from bolt 34-3, at a 19-inch diameter. B was from 16-2, at 16 inches. C was from 43-1, at 23½ inches. D was from 43-1, at 17 inches.

The logs used in the knot study included those used for the veneer-cutting study reported here. It was found that in medium-sized logs from site II the average length of live knots was 3.7 inches. After dying the branches continued to persist for many years, and in most cases extended through the bark. In the lower portions of these trees the average length of the dead knots was 8.5 inches. The larger knots (excluding pin knots) occurred at a frequency of 3.5 per lineal foot of log. Thus if such a log, 24 inches in diameter and 16 feet long, were cut into ⅛-inch veneer, down to a core of 6-inch diameter, the veneer produced would contain over 4,000 knots, the majority of which would be dead and would fall out during the drying!

Obviously, logs of this type could not furnish their own face veneers without much more patching than is considered economically feasible at present.

The suitability for face stock of veneer cut from rapidly grown Douglas-fir logs, even if free from knots, is open to question. At present such veneer, which displays a coarse grain pattern as compared to the fine-textured veneer obtained from large, slowly grown, old-growth logs, is considered inferior for faces because of its appearance and its lack of general serviceability. The growth rate and the number, size, and distribution of knots affect the grain pattern of veneer. The range of grain patterns in the veneer obtained in this study is illustrated in figure 1. Log No. 43, which grew at the rate of five rings per inch when its diameter was about 17 inches, yielded veneer of coarse texture, as shown in figure 1, D. Log No. 34, which grew at the rate of 20 rings per inch when at a 19-inch diameter, yielded the fine-textured veneer shown in figure 1, A.

The veneer shown in figure 1, C, did not grow much faster than that shown in Figure 1, B, yet would not be satisfactory, because of its large knots, for many uses for which B would suffice.

On the basis of appearance only, and assuming that the knots are not too pronounced to upset the pattern, there seems to be a fairly sharp dividing line at a growth rate of about 10 to 12 rings per inch between satisfactory and unsatisfactory face veneer from the standpoint of coarseness of texture.

Application of Results

The chief characteristics in which veneer cut from second-growth Douglas-fir logs differed from that produced from old-growth material were the presence of many knots and the coarse grain pattern. These features, together with such related factors as buckling and splitting, make the material unsuitable for plywood faces under present methods and standards.

Efforts are being made to devise methods of using low-grade face veneers in plywood by surfacing them with veneers of other species, or with paper, paper plastics, or other composition materials. The processes now in commercial use, however, for surfacing plywood with paper plastics or with thin face veneers of superior species require the use of veneers of good quality immediately beneath the surface ply in order to prevent the pattern of various interior defects from showing on the surface. Such panels, therefore, have generally been specialty products not marketed in competition with ordinary Douglas-fir plywood. It is possible that processes will be developed that will overcome these limitations and that will provide an outlet for higher precentages of low-grade veneers in panels.

On the other hand, it is possible to produce logs that will yield veneer having all the properties that are today considered desirable for panel faces. To do so requires the pruning of selected trees and the control of their growth rate by silvicultural methods so that it does not exceed the rate of 10 to 12 rings per inch of radius that was found to be necessary for the production of high-quality, defect-free face veneers.

In the economic field, figures could probably be advanced to bolster the argument in favor of silviculture by comparing the present cost of pruning a 16-foot log against the future cost of making 4,000 veneer patches. In the larger sense, however, such statistics are irrelevant. The basic question arising from these and similar studies is not of the cost-sheet variety; it is, bluntly, whether we will have, 80 or 100 years from now, even a reasonable supply of high-quality Douglas-fir veneer logs. The knotty, coarse-grained character of the young, thrifty second-growth timber would appear to answer that question decisively in the negative. This situation will prevail until those charged with responsibility for timber management take action to secure quality growth at a reasonable cost rather than quantity growth at a minimum cost.

Thinning Even-Aged Loblolly and Slash Pine Stands to Specified Densities

R. Stahelin

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Thinning studies require a reliable measure of the densities achieved by the thinning treatments selected. The relationship between average d.b.h. and normal basal area per acre has been used to provide such a measure for experiments at Auburn, Alabama.

THIS paper presents a method of expressing stand density that is especially useful in studies designed to determine the best stand densities of loblolly and slash pine for given sites and management objectives. For loblolly and slash pines, the basal area of a fully stocked stand at a given average diameter based on the yield tables for second-growth southern pines (*9*) seems to the writer to make the best standard for this purpose. The method assumes that the harmonized yield table data are reliable and significant, and that area required by the average tree is a function of mean diameter. Unit area for the average tree then can be converted to number of trees per acre, and then to basal area per acre.

For loblolly and slash pines, the relationship of total basal area per acre to d.b.h. of the tree of average basal area varies but little with site and age in fully stocked stands under 60 years of age. The curve in Figure 1 for 100 percent loblolly pine stocking shows total basal area in relation to average d.b.h. of all trees 1.6 inches d.b.h. and larger. It fits closely the values given for all site and age combinations in the yield tables up to about 16 inches in average d.b.h. The same close relationship holds true for slash pine.

The 100 percent stocking curve for loblolly pine was derived from the tree-area expression of Chisman and Schumacher (*2*): Acres required by single tree =

$$.0000480 + .0000668d + .0000267d^2,$$

where d is measured in inches. These authors found "no perceptible effect of age and site index on tree-area ratio—hence on the ground area allocation of a tree of given d.b.h."

The formula for loblolly pine, for trees 1.6 inches d.b.h. (2-inch) class and larger, derived from the above expression, is:

$$\text{Basal area in sq. ft. per acre} = \left(\frac{d}{.086936 + .07007d}\right)^2$$

The corresponding formula for slash pine is:

$$\text{Basal area in sq. ft. per acre} = \left(\frac{d}{.044765 + .073895d}\right)^2$$

The dashed line in Figure 1 shows the basal area of fully stocked stands exclusive of trees under 3.6 inches d.b.h. In stands whose average d.b.h. exceeds 7 or 8 inches, trees under 3.6 inches contribute very little to the total basal area. They may therefore be omitted from the computations. On the other hand, the curve is unreliable in determining percentage of stocking in stands under 4 inches in average d.b.h. because trees under 1.6 inches d.b.h., which are likely to be important in such stands, are disregarded.

Using values from the 100 percent stocking curve, basal areas for different percentages of stocking have been computed for both loblolly and slash pines. The resultant curves for loblolly are plotted in Figure 2. Table 1 gives the basal areas for 100 percent stocking for both slash and loblolly.

Using the Method

From either Table 1 or a chart like Figure 2, the relative density of a stand can be determined after its basal area and average diameter have been computed. To thin to a given density or percentage of full stocking, it is only necessary to compute the basal area that corresponds to the desired density. For this purpose the approximate average diameter of the reserve stand has to be estimated. The difference between the desired and the actual basal area per acre gives the basal area of the cut.

The basal area of the cut is written on the field sheet, which contains the stand table of the plot. During the marking, a tally of the trees to be cut is entered in the proper diameter classes alongside the original stand table. Thus it is easy to estimate whether the average diameter of the reserve stand will be the same as that of the original stand, and to make any necessary adjustments in the basal area of the cut. Marking continues until the desired basal area of the cut is reached. It is convenient to use tally sheets showing cumulative basal areas.

TABLE 1.—BASAL AREA PER ACRE FOR 100 PERCENT STOCKING

Average diameter breast high	Loblolly	Slash
inches	*Square feet*	
4	118.7	138.2
5	130.7	145.7
6	139.8	151.1
7	147.0	155.1
8	152.7	158.3
9	157.4	160.8
10	161.2	162.8
11	164.3	164.5
12	167.2	165.9
13	169.6	167.2
14	171.8	168.2
15	173.7	169.2
16	175.4	170.0

With a little practice, it is not hard to mark by eye within a few percent of the desired density. Stocking is estimated from the amount of open space to be created between the crowns by the removal of the marked trees. Only in overstocked stands is it difficult to mark heavily enough by eye. Even after thinning these stands appear to be lighter stocked than they actually are because of the shortness and narrowness of the crowns.

Comparison with Other Methods

Rules recommending certain spacings of trees or certain methods of expressing spacing have recently enjoyed much discussion. All are based on the premise that the desirable number of trees per acre depends on their average size. Averell has graphically compared several popular rules of thumb (*1*).

Reinecke's method (*7, 8*) expresses stand density in terms of the number of trees per acre and average diameter. It uses a logarithmic formula in which the logarithm of the number of trees per acre in a fully stocked stand equals: $-1.605 \log d + k$.

MacKinney and Chaiken (*4, 5*), using the same technique, reanalyzed the field data of the normal yield table for loblolly pine and derived a formula in which the logarithm of the number of trees per acre in a fully stocked stand equals: $-1.707 \log d + 4.1588$.

The writer feels that his own curve fits the yield-table data better than either of these logarithmic formulas. Even the formula of MacKinney and Chaiken appears to give values that are too high for stands with large average diameters and too low for diameters from 4 to 8 inches. Their logarithmic curve does not seem

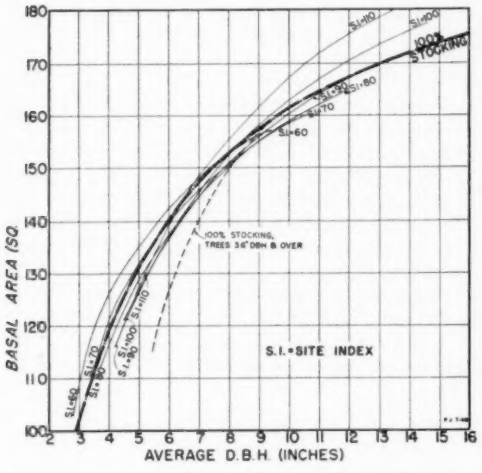

FIG. 1.—Loblolly pine. Comparison of general curve (all sites pooled) with individual curves restricted to single site classes. The site index curves illustrate the relationship of normal loblolly pine basal area per acre to average d.b.h. of trees more than 2 inches d.b.h. Data from U. S. Dept. of Agriculture Misc. Pub. 50.

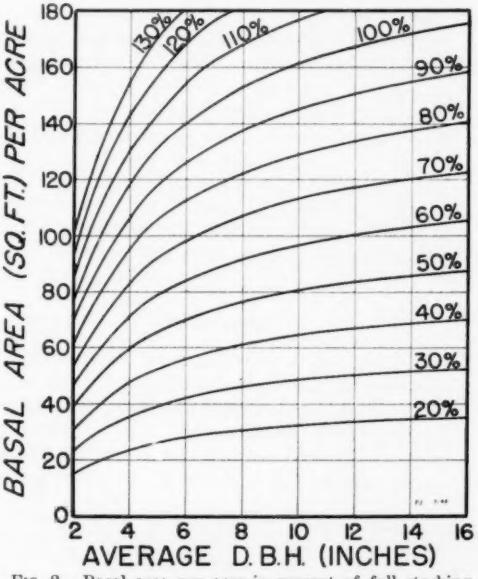

FIG. 2.—Basal area per acre in percent of full stocking for loblolly pine trees 2 inches d.b.h. and larger.

to allow sufficiently for the flattening out of the basal area which characterizes older stands or stands with large average diameters. Basal area changes much slower than number of trees with changes in the average diameter. It is, therefore, easier in actual marking to obtain approximately the desired density by keeping track of the basal area rather than the number of marked trees. Using basal area instead of number of trees causes no extra work, for the basal area has to be computed to determine the diameter of the average tree.

The popular D-plus rule (*6*) expresses spacing in feet as the d.b.h. of the tree in inches (*D*) plus a constant. For the dominant stand alone, full stocking for loblolly pine corresponds very closely to an average spacing of D + 4. Except where the constant is so computed as to designate the minimum distance between crop trees, however, this rule is more useful as a check on the density of a stand after thinning than as a guide for marking the thinning. It is very difficult to mark trees to obtain the desired average spacing, for the actual spacing of individual trees can only rarely conform to the spacing indicated by the rule. Moreover, the writer feels that a constant added to the diameter results in disproportionally greater basal areas for stands of large trees than for stands of small trees.

Expressing spacing as a percentage of the height of the dominant trees (*3, 10*), appears to be applicable to loblolly and slash pines. For the whole range of the yield table (trees 2 inches d.b.h. and larger), the ratio of spacing to height at full stocking varies only within narrow limits and is essentially constant. Height, however, becomes unreliable as a guide for spacing where extremely numerous trees of small diameter have heights approximately equal to larger trees.

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The Germination and Initial Establishment of Loblolly Pine Under Various Surface Soil Conditions[1]

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Experiments are reported covering the influence of soil texture and surface litter on germination and seedling survival.

THE demand for timber, coupled with its present distribution by age classes, has resulted in short rotation management for most of the loblolly pine type in the Coastal Plain of Virginia and North Carolina. Consequently, with only immature trees available for seed production, the early establishment of a new crop requires that a high percentage of the viable seeds germinate under conditions permitting continued growth.

There is considerable evidence that mats of duff or other forest debris can retard germination of pines, and conversely that mineral soil or ash surfaces are better seedbeds. Shirley (*9*) found that disking the soil increased the number of Norway pine conspicuously. Osborne and Harper (*8*) obtained similar effects in the Southeast with slash and longleaf pines, which Gemmer, (*3*) et al., verified in Mississippi. In another study Gemmer (*4*) determined that loblolly pine reproduction can be increased by partially exposing mineral soil before seedfall by cultivation or raking, or possibly by logging, or perhaps in rare cases by burning.

Fabricius (*1*) found that ashes from forest fires hinder reproduction of all common trees. Haig (*5*) found that seedlings on burnt mineral soil, particularly under partial shade, were larger and more vigorous than their associates on nearby mineral soil. He also determined that litter surfaces are relatively unsatisfactory from the standpoint of both germination and initial survival of western white pine and associated species.

Fisher (*2*), working with western pines, found that germination was best on ash surfaces, although rotton wood, some forms of leaf litter, and mineral soil gave practically as good results.

Procedure

The effect of various soils and soil surface treatments was investigated at the Bigwoods Experimental Forest,[2] in order to isolate the importance of these variables on germination and establishment of loblolly pine. Germination tests were made on undisturbed samples in a greenhouse under controlled temperature and moisture conditions.

Paired soil samples were obtained of:

1. Three surface conditions (undisturbed, burned, and organic matter mixed with soil as a result of logging activity).
2. Two kinds of duff (pine and hardwood).[3]
3. Three soil textural classes (light, medium, and heavy).

The "light" soils were deep well drained sands of the Cahaba and Kalmia series. The "medium" soils were Craven loam and very fine sandy loam in which a shallow A horizon was underlain by clay. The "heavy" soils were Lenoir silt loam and Coxville clay loam.

All samples involving burned or disturbed surface conditions came from tracts logged within the past year. The places where the burned condition was to be sampled were selected in midsummer and burned over at that time.

The seeds used in this study were cleaned by the flotation method, stratified for two months at 36° F. and then carefully examined for impurities before being sown. One hundred seeds were dropped on each soil sample.

All soil samples were watered at the same rate at intervals of 2 to 4 days as determined by the surface conditions of the bare, fine sandy loam soils. Records of germination and mortality were posted daily.

Germination

The condition of the surface of the ground is an important factor in determining the percentage of viable seeds that germinate. Better germination occured on surfaces disturbed by logging activity than on either burned or undisturbed surfaces (Table 1). Significant differ-

[1]Part of a thesis submitted to the School of Forestry, Duke University, Durham, N. C.

[2]Maintained by the Southeastern Forest Experiment Station in cooperation with the Camp Manufacturing Company, Inc., Franklin, Va.

[3]The term "duff" as used in this study applies to all natural forest floor materials lying above the mineral soil.

ences in germination percentages did not exist between soil textural classes (Table 1) or between duff types (Table 2).

It appears that the correlation between surface condition and availability of moisture has been the controlling factor in this study. Seeds that were in contact with moist soil or bits of damp, rotton wood germinated within a few days. Seeds resting upon leaves that were beginning to rot, germinated more rapidly than seeds on dry leaves. Seeds on dry leaves and bits of charred debris apparently had to accumulate moisture from a number of waterings before they could make sufficient growth to rupture their seed coats.

The importance of moisture availability is further demonstrated by the germination results on well burned and poorly burned samples. Samples from areas where mineral soil had been exposed by very hot fires resulting from slash accumulations were classed as "well burned." "Poorly burned" samples came from burned areas between slash piles where the mineral soil was rarely exposed, although the thickness of the duff layer was generally reduced about 80 percent. The germination rate for the six poorly burned samples is very similar to that for undisturbed duff surfaces and ranges from 35 to 86 percent. The range for the six well burned samples is 85 to 99 percent. The latter range corresponds closely to that for surfaces disturbed in logging.

TABLE 1.—PERCENTAGE OF SEED GERMINATING ON DIFFERENT SOIL TEXTURAL CLASSES AND SURFACES

Soil textural class	Surface condition			Average
	Undisturbed	Burned	Logged	
	Percent	*Percent*	*Percent*	*Percent*
Light	67.75	77.50	90.25	78.50
Medium	57.75	68.50	92.50	72.92
Heavy	74.25	88.25	91.25	84.58
Average ..	66.58	'78.08	91.33[1]	78.67

[1]Significantly greater (at one percent level) than averages for other surfaces.

TABLE 2.—PERCENTAGE OF SEED GERMINATING ON DIFFERENT DUFF TYPES AND SOIL SURFACES

Duff type	Surface condition			Average
	Undisturbed	Burned	Logged	
	Percent	*Percent*	*Percent*	*Percent*
Pine	68.50	87.83	94.50	83.63
Hardwood ..	64.67	68.33	88.17	73.72
Average ..	66.58	78.08	91.33	78.67

Mortality

Forty-five percent of the germinated seedlings were lost during the experiment. The causes of loss were failure of the radicle to take root, 83 percent; death due to fungi, 11 percent; eaten or removed by cockroaches, 5 percent; other losses (soil fauna), 1 percent.

When a seed germinates, the young radicle turns downward as soon as it emerges from the seed coat. If the growing tip does not come in contact with a moist medium that it can penetrate, the seedling will die within a few days even though moisture is being made available at frequent intervals.

Seedling establishment on exposed heavy soils depended upon the chance finding of a crack in which the radicle could anchor itself. An analysis in which adjustments were made for differences in germination disclosed that losses on heavy soils because of failure to root were greater than losses from the same cause on light and medium soils (Table 3). Heavy soils frequently become baked after a clean burn or become puddled if there are repeated trips by logging equipment over the same route. Both treatments cause the soil surface to become relatively impenetrable by loblolly pine radicles.

Root Development

The ability of a seedling to root deeply in the early stages of its development is an important factor in survival during the first growing season. The ease or difficulty with which a primary root can penetrate a soil may be correlated with the soil texture. Depth of root penetration by the radicle was determined for 24 seedlings on

TABLE 3.—MORTALITY DUE TO FAILURE OF RADICLE TO PENETRATE THE SOIL[1]

Soil textural class	Surface condition			Average
	Undisturbed	Burned	Logged	
	Percent	*Percent*	*Percent*	*Percent*
Light	32.3	38.1	26.9	32.4
Medium	34.8	28.9	28.7	30.9
Heavy	30.9	54.4	56.6	47.3[2]
Average	32.7	40.5	37.4	36.8

[1]Adjusted by analysis of covariance for differences in germination.

[2]Significant at the five percent level.

each of the three soil types. Root penetration in the "heavy" soil was significantly less than that in either the "medium" or "light" soils (Table 4).

TABLE 4.—DEPTH OF SOIL PENETRATION BY THE PRIMARY ROOT[1]

Soil textural class	Depth of penetration
	mm.
Light (sand)	35.3
Medium (loam)	32.1
Heavy (clay loam)	21.7[2]

[1]Adjusted by analysis of covariance to eliminate differences due to age of the seedlings.

[2]Significant at the five percent level.

Summary

The germination of loblolly pine seed depends upon the capacity of the seed to absorb moisture from the surface with which it is in contact.

Soils that have been disturbed by logging activity provide the greatest number of favorable contact points in the form of bare soil. The germination rate becomes progressively poorer as the surface condition classes grade from well burned to undisturbed litter.

After germination a seedling must obtain greater quantities of moisture in order to survive and grow. Failure of its radicle to enter a favorable substrate from which the required amount of moisture could be obtained, accounted for 83 percent of the losses in this study. The greatest loss occurred on the silt loam and clay loam soils that had been baked by fire or puddled by logging equipment.

Silvicultural Application

The results of this study and others like it indicate that a greater percentage of the available seeds will germinate if the soil surface is scarified. A considerable portion of the surface can be scarified during the logging operation by the use of tractor equipment. The drivers should be instructed to approach the loading area by a new route whenever possible. This results in the breaking down of the unwanted hardwoods as well as disturbing more soil and also tends to minimize the puddling of heavy soils by repeated trips over the same route.

If the use of heavy logging equipment is not economically feasible, good seed bed conditions can be obtained by the use of fire. If prescribed burning is resorted to, a hot fire should be obtained so that all of the Ao horizon will be consumed. A less hazardous method would be to scarify the area between slash piles with a heavy duty disk plow. The slash piles could then be burned individually during periods of low fire hazard.

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Is Litter a Barrier to the Initial Establishment of Shortleaf and Loblolly Pine Reproduction?

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With the bumper shortleaf-loblolly pine seed crop of 1947, litter on the Crossett Experimental Forest did not prevent initial establishment of adequate numbers of pine seedlings in stands in which there had been no special seedbed preparation.

IT HAS been observed that where shortleaf and loblolly pine seed falls on mineral soil, germination and initial survival are excellent. This has sometimes led to the conclusion that such exposed seedbed conditions are essential to adequate reproduction. Furthermore, it has been reasoned that litter must be removed by burning or some mechanical means to insure satisfactory regeneration (*3, 4*). As a check on this point, the heavy 1947 seed crop in south Arkansas provided a good opportunity for study.

Method of Study

In August 1948, 190 mechanically spaced milacre plots were used to sample one 40-acre compartment of the Crossett Experimental Forest in Arkansas. Compartment 51, the "good farm forestry forty," was chosen because it bears a stand heavy enough to provide abundant litter, has been opened up sufficiently to stimulate seed production, and is representative of areas cut selectively under management. There has been no fire on this compartment for fifteen years or more, and it has been logged every year since 1937. Because the harvest is made annually, the cut is rather light and is confined to a small portion of the compartment. As a consequence, the litter is disturbed only on limited areas. The compartment has 7,982 board feet per acre (International ¼-inch rule) in shortleaf and loblolly pines 11.5 inches and over in diameter, and a good stand of smaller pines.

On each milacre plot, the number of live pine seedlings from the 1947 seed crop was recorded. In four places on each plot, litter depth was measured to the nearest 0.1 inch. The average of the four measurements was used to represent the depth of litter on each plot. All hardwood leaves and pine needles—decomposed or not—lying on the mineral soil were considered litter. Litter on each plot was classified as pine, pine-hardwood, or hardwood.

In addition, 35 milacre plots were taken on compartment 96. This compartment has been left as a natural area. It has not been logged for thirty years and has not been burned for fifteen years or more. It bears a stand of pine saw timber which averages 5,000 board feet per acre.

Unless specific reference is made to compartment 96, the data in the following discussion are those from compartment 51.

Results

Table 1 gives the August 1948 seedling count by various plot classifications. On the 190 milacre plots examined, an average of 10.3 seedlings was found, indicating an average of 10,300 seedlings per acre. This number is far more than is needed for adequate stocking, even if heavy mortality should take place. Furthermore, these seedlings had survived a 4-week drought in May and June and therefore could be considered reasonably well established. Distribution was good, since 85.3 percent of the milacre plots contained at least one seedling.

The depth of litter averaged 1.3 inches for all plots. Litter depth remains at this comparatively low level because disintegration and decomposition take place rapidly. Observation indicates that this is the approximate average depth in long-unburned, second-growth shortleaf-loblolly pine-hardwood stands in this locality. In dense oldfield pine stands, where the forest floor is more heavily shaded, other conditions may prevail.

Plots which fell on skid roads and logging roads had only 0.5 inch of litter and about six times as many seedlings as plots with undisturbed litter. One milacre plot on a skid road had 114 seedlings. This is in keeping with the findings of Brinkman and Swarthout (*2*), Gemmer (*5*), Barrett (*1*), and others who have reported a much higher seedling establishment in mineral soil. On the balance of the area (exclusive of skid and logging roads), the litter averaged 1.4 inches deep and seedlings 7,500 per acre. This is still considerably in excess of requirements for adequate stocking.

Plots which fell in logging slash had the lowest average seedling count. Litter was deepest

here, the average being 2.6 inches and the greatest on any plot 5.0 inches. Since 20 of the plots fell in slash, about 11 percent of the area was so occupied. This figure is surprisingly low when one considers that this area has been logged every year for the past decade. Of the 20 plots in slash, 11 (or 55 percent) bore no seedlings. Where seedlings were present, they did not occur in the very heavy litter which characterized these plots, but were found on the side of or under the raised portions of main stems or large branches of the felled tree tops, where the litter was comparatively light. These seedlings should have no trouble in growing through the slash. Barring disturbance by logging, fire, or other agency, seedling establishment in the heavy litter under slash evidently will have to wait until decomposition reduces litter depth, probably in about three years.

There was considerable difference in the average number of seedlings on pine, pine-hardwood, and hardwood litter, though the average litter depth for the three classifications was roughly the same. The pine litter plots usually fell close to or under pine trees of seed-bearing size, so that the supply of seed on these plots was probably heavier than elsewhere. The hardwood litter plots fell along stream banks or in hardwood patches, usually some distance from a pine seed source. Whether litter composition and structure affected the seedling catch on different litter types, was not determined in this investigation.

All the 8 plots without litter were in open areas with heavy grass or sod. In places where the grass was not matted or had not formed sod, from 5 to 10 seedlings were found per plot, which is good stocking. In matted grass or sod, the stocking varied from zero to 2 seedlings per plot. Too few plots fell in grassy areas to lend much weight to these data.

Of the 28 plots which contained no 1948 seedlings, 11 fell in logging slash, 1 on an eroding stream bank, 2 on sod, 1 under a low-canopied dogwood, and 13 on ordinary areas with an average litter depth of 1.6 inches. Many of these plots bore some older pine reproduction. The reason for the lack of 1948 seedlings on the 13 plots was not apparent.

The relationship between the average depth of litter and the average number of seedlings per milacre is shown in Figure 1. In general, the number of seedlings per milacre increased as litter depth decreased. The data are weak for litter depths greater than 2.5 inches, which are represented by only 12 plots.

An average of 8,300 pine seedlings per acre was recorded in compartment 96. In compartment 51, excluding the count taken on skid and logging roads, an average of 7,500 seedlings per acre was found. Since more seedlings were found on the undisturbed compartment, it is evident that a good seedling stand is not dependent on disturbance of litter by logging.

The average litter depth was 1.0 inch on compartment 96 and 1.4 inches (excluding skid roads) on compartment 51. The presence of logging slash on compartment 51 and its total absence on compartment 96 largely account for

TABLE 1.—AUGUST 1948 SEEDLING COUNT AND LITTER DEPTH; COMPARTMENT 51, CROSSETT EXPERIMENTAL FOREST

	Milacres examined	Milacres with one or more seedlings	Seedlings per average milacre	Average depth of litter
	Number	*Percent*	*Number*	*Inches*
All plots tallied	190	85.3	10.3	1.3
By location:				
On logging and skid roads	15	100.0	43.1	.5
All other locations	175	84.0	7.5	1.4
By litter class:				
Pine litter	120	89.2	13.3	1.4
Pine-hardwood litter	43	81.4	6.5	1.4
Hardwood litter	19	73.7	2.9	1.1
No litter, but heavy grass cover	8	75.0	3.2	.0
Plots in logging slash	20	45.0	1.3	2.6
Plots with no 1948 seedlings	28	0	0	1.9

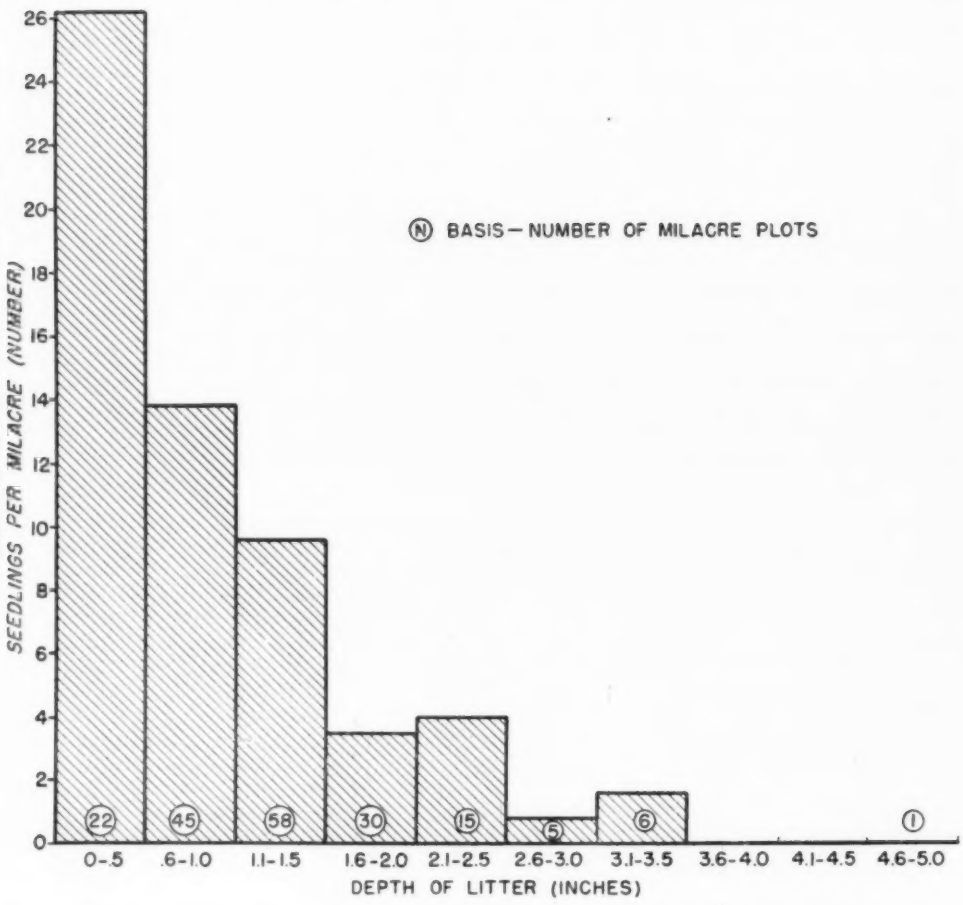

FIG. 1.—Relationship between average depth of litter and average number of seedlings per milacre; compartment 51, Crossett Experimental Forest. Open plots with no forest litter are excluded.

the difference in average litter depth. Excluding the plots in logging slash on compartment 51 brings the average litter depth for that compartment down to 1.1 inches. Another factor is that the saw-timber stand on compartment 51 is heavier than on compartment 96. On a comparable basis, the litter depth on both compartments is about the same.

Conclusions

The depth of litter was measured in second-growth shortleaf-loblolly pine-hardwood stands on the Crossett Experimental Forest. The study areas are managed on the individual-tree selection system and have been protected from fire for 15 years or more. Average depth of litter was about 1.3 inches. This is the result of the balance maintained between leaf fall and normal decomposition. A similar litter depth probably prevails in other portions of this timber type where climate, soil, stand, cutting practice, and fire protection are similar.

In August 1948, the main area sampled (compartment 51) averaged 10,300 pine seedlings per acre from the 1947 seed crop. This is far in excess of the needs for adequate restocking after allowance is made for probable mortality after initial establishment.

Skid roads and logging roads from which the litter was largely removed bore almost six times as many seedlings as areas which were relatively undisturbed. These roads averaged 43,100 seedlings per acre, as against 7,500 per acre on the rest of the area.

The heaviest litter under the tops of recently felled large trees prevented the establishment of seedlings. Some seedlings, however, became established in small spots under loging slash where the litter was relatively light. Under the individual-tree selection system, a comparatively small portion of the area is occupied by logging slash at any one time, and so there is no need

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FIG. 2.—1948 pine seedlings (1947 seed) established in pine litter 1.9 inches deep. Litter is shown cut away to mineral soil. Gage is graduated in inches. Compartment 96, Crossett Experimental Forest, September 1948.

for special treatment of the slash or the resultant litter.

There appears to be no need for special seedbed preparation to obtain satisfactory initial establishment from bumper seed crops in shortleaf-loblolly pine-hardwood stands similar to those found in south Arkansas, when they are managed under the individual-tree selection system and protected from fire.

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Abstract of Master's Thesis

The Effect of Topography and Land Use on Ruffed Grouse in Southern Michigan. By Herrick L. Wilson. 96 pages double-spaced thesis paper, bound. 9 tables, 31 plates, 38 references. 1948. The University of Michigan, School of Forestry and Conservation, Ann Arbor.

One year was spent on this thesis, the materials for which were gathered in the vicinity of Ann Arbor and the Gladwin State Game Refuge, a comparison unit lying further to the north. The study centered around the Interlobate Lake district in which there are thousands of acres of marsh and swamp.

There was one grouse per eight to nine acres for the units studied. This figure parallels previous studies which indicate that cyclic fluctuations may not exist. Typical spring and summer cover consisted of dense herbaceous plants and shrubs overhung by trees. There were three types of winter cover: unprotected forms in swamp hardwoods, protected forms in brush understories, and roosts in conifers. Broods came off on the uplands, moved into the basins in late summer, and dispersed in the latter part of September.

Basins are of considerable importance largely through interior drainage resulting in subclimax types which offer suitable winter habitat for grouse and other wildlife. River, flood plain, and basin extend distinct vegetative types into upland areas thus providing essential grouse requirements. Topography enhances cover value, determines avenues of escape, and differentiates upland forest types on northern and southern slopes. When protected by topography, deciduous cover lasts further into autumn. Because of the limitation which topography places on cultivation, subclimax types and associated wildlife species continue to exist in the basins. On some units centered around basins there was a predator-prey ratio of almost one to one between grouse and red foxes.

There is a correlation between agriculture and moraines, the outer borders of which are composed of unproductive sand and gravel. Infertile soils, a lower farming population, and extensive forest land make the Gladwin area more productive of grouse. An excellent management plan is in operation on the refuge. A food and cover planting program holds populations sufficiently large for field trials. Grazing of woodlots has placed an additional limitation on grouse habitat in southern Michigan.

Silvicultural practices are of value; natural hardwood stands interspersed with coniferous plantations will support small numbers of grouse, especially, if there are scattered frost pockets which provide additional food within the shelter of the conifers. A grouse management plan for the Interlobate Lake district must consider the private landowner.

An Analysis of Forage Utilization Methods and a Proposal for Utilization Surveys by Range Condition Classes

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College of Agriculture, University of Arizona, Tucson. Most of the material contained in this paper was prepared while the writer was with the Pacific Region of the Soil Conservation Service. Thanks are given E. A. Johnson and F. G. Renner of that service for their helpful criticism of the manuscript.

FORAGE utilization surveys are an essential part of maintaining an active range program on most livestock ranches. These surveys indicate the correctness of the initial grazing capacity estimates. They also point out local problems of livestock maldistribution. At the same time they provide an opportunity for checking on any details of the range-management plan that may need attention.

Utilization surveys have long been included in the range programs of government and other public agencies. Chief among these perhaps are the Forest Service, the Soil Conservation Service, the Bureau of Land Management, and the Production and Marketing Administration. The discussion that follows may pertain less to agencies working only on public lands than to those working more directly with ranchers on their own lands. It will have some applicability, however, wherever utilization surveys are used.

In a few instances, after a brief training period, the rancher makes utilization surveys with little or no outside assistance. As these surveys should be included as a definite part of the ranch operation every year, they should be made by the rancher rather than by some outside agency. Observations made over a period of years, however, indicate that very few utilization surveys are made by ranchers. There are several reasons for this, one of which is the complexity of the techniques employed. These techniques have frequently been devised by research-station personnel for use on research projects. Even when this has not been the case, most of the methods are better adapted to the collection of research data than for practical field use by ranchers.

Requirements of a Survey Technique

In order to be widely used and to give reliable results, a method for making range utilization surveys must have certain minimum requirements.

It should be rapid, both in training and in application. Because of the press of other work, ranchers will devote little time to utilization surveys even when convinced of their value. Nor will they spend time on a job of this sort that may have to be repeated a few times before its value becomes apparent. For these reasons, no method is likely to be widely used by ranchers that is not rapid or that requires more than an absolute minimum of calculation or compilation subsequent to the field work.

The simpler the method, though still technically sound and workable, the greater acceptance it will have, not only among ranchers but among so-called technical men as well. Even many of the technical men are not range trained, and have little patience with involved techniques. Reliance on any method that considers primarily whether it can be used, rather than whether it will be, retards progress doubly; it not only provides a tool that is not used, but worse, it fails to provide one that is.

Any acceptable technique should possess a degree of accuracy and detail commensurate with the use to be made of the information. Any method that obtains results more detailed or accurate than are needed involves an unnecessary expenditure of time and money and tends to prevent its adoption. Techniques with a much higher degree of accuracy than is required have been devised. Uncontrollable fluctuations in forage production tend to make many aspects of a livestock operation inexact. For this reason, in part, any highly exact technique will tend to be useless in some degree. As a consequence, the time and cost required to obtain a high degree of accuracy will be largely wasted. In addition, the unnecessary complexity may discourage making of utilization surveys regardless of the method used.

Full consideration should be given to all factors that might necessitate a degree of use differing from that commonly considered proper for the key species. In view not only of the increasing emphasis that is being placed on forage appraisal by condition classes, but also of the inti-

mate relationship that exists between range condition and amount of grazable forage, any utilization method generally employed should make full allowance for difference in range condition. Proper-use factors differ with each condition class, though this is usually given only passing consideration in the techniques currently used.

Most variations in allowable use will be due to differences in condition. Other factors may require consideration, however, such as highly erodible soils, exposure of a major portion of an area to a given direction of slope, or long continued variations from the average rainfall. A prevailing southerly exposure, light sandy soils, or markedly subnormal rainfall, all might require that more than the usual amount of forage be left to control erosion and maintain production.

A practical field method should not be based too largely on fixed proper-use factors. Utilization techniques now in use rather generally require that the technician be able to estimate the degree of use with a rather high degree of accuracy in order to be able to state current use in terms of the proper-use factor of the more important species. It would appear that determining utilization with a high degree of accuracy is largely wasted time and effort when the proper-use factor has not been determined with equal accuracy. In making highly accurate utilization estimates, technicians may assume that the extent to which the plants can be grazed without harm, yet without any waste of forage, is known. Actually, we do not have this information in many instances, and the use of a given species can stand from year to year, or condition class to condition class, or site to site, or in different plant associations, is often so highly variable that no one figure can be set.

In addition, very little is really known as to the amount of grazing most of the grasses can endure without harm during the different seasons of the year. Yet such knowledge is requisite if it is essential to judge percent of utilization with a high degree of accuracy. If, for example, on *Agropyron spicatum*, 60 percent is average proper use for spring, summer, and fall grazing, stock might be permitted to remove 50 percent of the current growth from this same species in the early spring, but only 30 percent in the late spring. Or, if used solely for summer or fall grazing, the figure might run as high as 70 percent. These tentative figures illustrate the point that use proper for one season may be improper for another; and that, when utilization surveys are made primarily on a basis of percentage of forage removed, the correct local proper-use factor for the species concerned and the season involved must be known. It is not proposed that these factors in all their variations should be accurately determined, or that proper-use factors be discarded, but rather that a utilization technique should be employed that permits a flexibility in these factors and a simplification in the technique of recording the field data.

Review of Current Methods

Most range utilization surveys measure, directly or indirectly, the percent of forage removed by grazing. Because of the variety of techniques used, few individuals are readily able to recall the differences between most of them. For this reason, and in order that the reader may better judge the criticisms of each that follow, the more common methods in current use are defined in the paragraphs that follow. The inadequacies of each method are also briefly discussed.

General reconnaissance method.—"With the general reconnaissance method, the investigator inspects an area of several hundred to several thousand acres, more or less in detail, making estimates of utilization for the entire unit, either for all vegetation or by individual species. These estimates are made of the percentages of total plant height or volume production removed by grazing" (*7*). This method, as its name implies is general in nature; as the term is commonly used, it refers to any more or less casual or offhand examination of forage use. Surveys of the sort usually made by ranchers, using either the key species or all the forage produced, would fall in this category. Some form of this method seems to have definite merit as it is rapid, not difficult to learn, and variations in individual's estimates appear to be within the limits of our knowledge of the true proper-use factors and of other variables, such as weather, that may markedly affect plant growth from year to year and place to place.

Measurement method.—"The measurement method is based on the premise that percentage utilization of grasses is equal to the reduction in average leaf height as a result of grazing" (*7*). As has been shown by Lomasson and Jensen

(*5, 6*) and by Crafts (*2*), there is not a direct relation between percentage utilization of grasses and reduction af average leaf height. Furthermore, as pointed out by Pechanec and Pickford (*7*), the method requires the use of paired grazed and ungrazed plots and requires an excessive amount of time and labor in making the survey and in compilation of data.

Volume by weight method.—"The volume-by-weight method is based on the assumption that percentage utilization of grasses is equal to the percentage reduction that occurs in volume by weight of herbage on an area, as a result of grazing" (*7*). This assumption is, obviously, correct. However, this method, like the preceding one, requires the use of paired grazed and ungrazed plots and clipping and weighing of forage from a sufficient number of these to eliminate for the most part errors due to sampling.

Stem-count method.—"The stem-count method is based on the premise that percentage utilization varies directly with the total number of stems that are grazed" (*7*). This method is adapted for use only on single-stemmed species such as *Agropyron smithii* or *A. dasystachium* and is, therefore, not suited for use on bunchgrass ranges. As it also assumes that all of a given stem is removed by grazing, an assumption that is frequently contrary to fact, there is a tendency to overestimate the degree of use.

Ocular-estimate-by-plot method.—"The ocular-estimate-by-plot method (is) a modification of the general reconnaissance method. It differs . . . in that each estimate is made on a plot of such limited area that the entire plot is clearly visible from one point, and percentage utilization is the average of estimates from a series of plots selected at random" (*7*). In utilization surveys the ocular-estimate-by-plot method is to the general reconnaissance method as, in range surveys, the square-foot-density system is to the reconnaissance system. As with the square-foot-density system, the ocular-estimate-by-plot method is tedious and requires too much compilation to be popular with ranchers. In addition, it is not sufficiently rapid to be practical on the average or larger than average-size range operation. It also relies largely on an assumedly accurate knowledge of proper-use factors. In the field use of this method, it is common practice largely to disregard factors such as range condition that should modify the proper-use factor used. Ignoring or touching only lightly on these factors, however, is not inherent in the method itself.

Instructions for the use of this method (*8*) specify that several hours' training should be spent learning the technique of estimating percentages as well as in rechecking these estimates from time to time. Few ranchers or even non-range-trained technicians will go to this trouble in making a utilization survey. Nor, for the most part, are they willing to cover a ranch on foot, or even on horseback, stopping at prescribed intervals to estimate and record utilization on hundred-square-foot plots.

Ocular-estimate-by-average-of-plants method—"The ocular-estimate-by-average-of-plants method is an additional refinement of the ocular-estimate-by-plot method devised for grasses. It differs only in that percentage removal by weight is estimated for each plant within the block, or plot, and the average of these estimates is taken as percentage utilization for the plot" (*7*). The ocular-estimate-by-average-of-plants method is more time-consuming than the ocular-estimate-by-plot method. In addition, it has not been found practical for all the reasons enumerated under the previous method.

Primary forage plant method.—The primary-forage-plant method (*3*) describes the general appearance of the range under each of nine degrees of use. The range is classified into utilization zones by describing the appearance of the primary, secondary, and low-value forage plants and of such other factors as trampling, physical damage other than grazing, to the vegetation, and prevalence of annuals. This method appears to have certain advantages not possessed by any of the other methods in current use. One of these is that the observations are expressed in general terms, rather than in specific percentages; another that the classification depends in large part on attention to the various earmarks that characterize ranges receiving different degrees of use. Nine degrees of use, however, seem more than necessary. Also, the recommendation that utilization zones be mapped after the field work has been completed does not appear to make for most efficient and accurate work.

Height-weight method.—The height-weight method (*6*) is based on the fact that "each grass species has a form sufficiently different to distinguish it from other species. . . . Each species not only has a form factor, but . . . there is a consistent height-weight relationship between plants of the same species."

This method, if used only as an occasional check on accuracy and not as a technique for use

throughout a given survey, has proved practical. The utilization gauge is easily carried and read, and provides a rapid means of connverting stubble height to percent of forage removed. Experience has indicated, however, that use of the gauge should generally be limited to preliminary training or an occasional accuracy check. Principal objections to making a complete utilization survey with the gauge are that the method is too time consuming, the readings must be recorded on special forms, and subsequent calculation of utilization must be made from the data recorded on the form.

The originators of the method apparently recognized that its applicability in extensive surveys was limited. This recognition is indicated by the following quotation from their original description of the technique (*6*): "Because of the limited time and the vast areas upon which utilization must be determined, it is practically impossible to measure each individual utilization area by the prescribed method. . . . By training the eye to recognize measured degrees of utilization, the larger areas may subsequently be covered by the ocular method."

The Range Condition Method

Stress is laid on the premise that a number of factors must be considered rather equally in making a utilization check. These include not only forage removed or left by grazing, but also, as an indication of the amount that should be removed or left, vigor of the key species, adequacy of the litter in maintaining or building topsoils, and effectiveness of the ungrazed forage in controlling erosion. With the exception of percent of forage removed by grazing, these factors are not subject to measurement or highly refined mathematical techniques. Combined, they indicate range condition.

The percentage of forage that is removed from a given key species is determined by the height-weight utilization gauge. The gauge is employed strictly for training purposes, however, and should be used only for an occasional check on accuracy after proficiency in estimating has been acquired.

Proper use as related to range condition.—Proper use as applied to range forage may be defined as that degree of forage utilization that results in a minimum of forage wastage, yet leaves enough vegetation to permit use of the range on a sustained yield or an increased-yield basis. This involves a maintenance of top-condition ranges and improvement to top condition of those that are run down.

The amount of grazing any plant can withstand without harm depends on its general well-being or condition. As the range as a whole is in no better or worse condition than the sum of its individual plants, it follows that the degree of grazing any plant receives should be determined in large part by the condition of the range. It has been a common practice to assign a seasonal or a year-long proper-use factor to a given species regardless of the condition of the range. This practice tacitly assumes that weakened plants on a rundown range can withstand as severe grazing as vigorous plants on a range in excellent condition. In part, because the rate of range stocking has been based on these incorrect proper-use factors, there have been too many instances of the sort referred to by Bailey (*1*) when he says that "ranges considered to be in good condition because key grasses were being grazed no more than was allowable according to the utilization tables were in reality deteriorating rapidly." He makes this observation in connection with the additional statement that "because of the great variability of sites—proper-use factors cannot be assigned to the various forage species that will enable the manager to use them *alone* in determining grazing response. Proper-use factors and key species are valuable only if they are derived from a sound ecologic understanding of the area, and even then they must be used in conjunction with other evidence such as is asociated with the soil."

The range-condition method employs a flexible proper-use factor for each key species; the factor used depending on the condition of the range within a given forage type. For example, if bluebunch wheatgrass (*Agropyron spicatum*) were the key species, the proper-use factors by range-condition classes might be: excellent 60 percent, good 50 percent, fair 40 percent, poor 30 percent, and very poor 20 percent to zero.

Use of key species.—Utilization data normally will need to be recorded only on key species inasmuch as maintenance or increase of these species will maintain or increase the range carrying capacity and control erosion. Data on a single species will usually suffice. Occasionally, however, as on ranges reseeded to two or more species, where annuals constitute the key species, or on mixed grass-browse ranges, information on two or more key species may be required.

Value of field training.—With any method of making utilization surveys, careful training is essential. It is even more important here, however, than in the slower techniques based more largely on volumetric measurements. Proficiency in the use of the range-condition method can be obtained only by discussion and training in the field with an individual experienced in the method, one who has a sound understanding of the fundamentals underlying true proper use of forage species. The most important fundamental consideration is that utilization of any key species must not be in excess of the amount that will maintain a range in top condition or build it up to top condition.

Field Application

An ability to designate the key forage species and to determine the condition of the range is essential. This knowledge, plus a map of the ranch, a pencil, and some means of getting around, is all the equipment a rancher or technician needs after his preliminary training period. Key areas on which stock tend to graze and which, if properly utilized will indicate that most of the balance of the range is likewise essentially properly grazed, are selected for observation. In travelling from one to another of these key areas, the examiner may also record the utilization observed on the interlying areas.

All the field notes are recorded directly on the map of the ranch at the time of observation. One plant symbol and two figures are recorded for each key species thus $\frac{\text{Asp}}{40\text{-}20}$. Asp is the symbol of the key species, bluebunch wheatgrass; the first figure gives the approximate proper-use factor of this species on the site in its present condition; the second figure gives current utilization expressed in terms of the first. Assuming that 40 percent represents proper use of this grass in fair condition, the figure 40 here would indicate a fair condition range. The second figure, 20 in the example cited, does not indicate merely that a measured 20 percent of the current year's growth of forage has been removed from the plant in question. It does indicate that about half of the grazable forage has been removed considering the condition of the range, which involves plant vigor, litter accumulation and erosion; considering other factors such as grazing use on all other species in the utilization zone, abnormal susceptibility of the site to erosion, past use, unusual climatic conditions, and allowable grazing rate.

Utilization zones are differentiated whenever areas large enough to affect ranch management or the numbers of stock run are clearly distinguishable. Ordinarily differences in current use that do not change the second figure by more than 10 points are not recorded.

After the entire ranch or other area on which a utilization survey is being made has been covered in this way, the map may be colored to show three degrees of use: over, proper, and under. A suggested color scheme is red for overuse, yellow for proper use, and green for underuse.

Discussion

The method described has been tested for each of the past four years on about 38,600 acres of range land in central Washington. It has proved rapid, easy to learn and apply, and has provided practical information that has been used by the ranchers in modifying their management practices. The method is not new in the sense of providing wholly new principles or techniques. It adopts and enlarges upon ideas included in other methods, notably the general reconnaissance method and the height-weight method. It goes farther than these, however, in adding some new ideas and in combining the whole into a single, easily applied field technique.

It will be noted that a technique for making exact mathematical measurements has not been proposed. According to Lantow (*4*), "A method for utilization surveys is not solely a mathematical question, and I doubt whether it ever can be made so." It has been stated before but will bear repeating, that careful training under an experienced man is essential in attaining proficiency in the use of this method. There can be no substitute for this training in instructing an individual how to estimate utilization correctly.

That entirely adequate, essentially non-mathematical utilization checks can be made has been demonstrated by the four years of testing to which this proposed method has been subjected, by the many successful ranchers who have been making their own observational checks for years, and by the nonmathematical method currently employed by the U. S. Grazing Service (*3*).

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Abstract of Master's Thesis

Some Effects of Forest Fires on Mortality and Growth of Certain Species of Southern Pines. By Joe Dae Burns. Louisiana State Univ. 1948.

FIRE damage appraisal methods used in the South are unsatisfactory due to the lack of accurate information as to the effect of fires on forests under varied types and conditions. This study was made with a purpose of obtaining necessary information that could be used, along with information from similar studies, in establishing a more accurate damage appraisal method.

A detailed discussion of previous studies on the effects of fire on the principal species of southern pines (loblolly, longleaf, slash, and shortleaf) is given; including, the numerous detrimental effects and the factors which cause variations in these effects.

Recognition is given to the increasing advocation of prescribed burning as a silvicultural and protection tool in managing some species of southern pines with a discussion of the proposed benefits to be received.

To supplement these studies, the procedure and results of a field study of the effects of wildfires on the growth and mortality of southern pines is given. A total of seventeen research plots were established in St. Helena, Tangipahoa, Washington, and Webster Parishes in Louisiana on forest stands of different species and sizes which were burned by wildfires between January 1, 1947 and April 1, 1947. Six of these plots had comparative check plots for comparison of growth.

It was found that the effects of the fires varied with the species, size of trees, date of burns and intensity of the fires. These findings, for the particular conditions on each stand, will add to the information needed for establishing an accurate damage appraisal method that can be used in the field.

It is proposed that damage from fully stocked stands of pine reproduction being destroyed by fire be appraised by applying an established average annual growth for the rotation by species and site-class for the number of years "setback" in growth due to the fire.

The heavy losses found in some cases might have been prevented by the use of prescribed burning to reduce the fuel accumulations.

Aspen as a Forest Crop in the Lake States[1]

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Management of aspen in the Lake States has received little attention in the past. Recently a rapidly expanding market for forest products and the heavy drain on other species have focused attention on it. The possibilities of aspen as a forest crop are now being viewed rather optimistically by forest managers. This paper gives information on the possibilities as well as the difficulties of managing aspen.

THE ASPEN type has spread rapidly in the Lake States since the turn of the century. This is the result of past clear-cutting pine, spruce, and hardwoods, followed by slash fires and other fires that killed mature or second-growth stands. Aspen now covers nearly 40 percent of the commercial forest area of the region, or 19.9 million acres according to the latest Forest Survey statistics (1945). Six percent of the total commercial aspen type is of sawlog size. Pole stands cover 18 percent. The remaining area is in restocking and denuded land.

Despite the fact that aspen springs up on all kinds of soils, it is one of the most sensitive species in site requirements. On favorable sites aspen develops into a good tree; on unsuitable sites it is short and scrubby and breaks down at an early age. It is estimated by the Forest Survey that 15 percent of the aspen in the Lake States is on good sites, 54 percent is on medium sites, and the remaining 31 percent on poor sites. Only the good sites will produce high-quality saw-logs and veneer. The medium sites will yield low-grade sawlogs and box bolts, but the main product on these sites will be pulpwood. Some of the poor sites will produce small pulpwood, but most of them are "off site" areas; that is, they will not yield merchantable products under present utilization standards.

Despite its many uses and the recent increase in degree of utilization, the best available information (*5*) indicates that only 40 percent of a total annual growth of 408 million board feet of aspen, is being used at present. Of the total annual cubic volume growth, the annual drain is only 25 percent. Since the demand is still considerably below the actual growth, especially for small low-grade products, it would seem that management efforts might more wisely be concentrated on the best sites where prime products can be grown.

[1]The data for this report were collected in northern Minnesota, it is believed, however, that the results have fairly wide applicability throughout the Lake States.

Yield in Unmanaged Stands

The yield of aspen, even on good sites, is rather low compared with that of most other commercial forest species. Early predictions (*8*) were too high, chiefly because proper weight was not given to: (a) the exceptionally high natural mortality rate of the species, (b) the natural slow-down in growth with age, and (c) the high incidence of cull, especially in older stands.

Most cull in older stands is caused by wood rots of which the false tinder fungus (*Fomes igniarius*) is the most serious. In its final stage it may cause decay throughout the entire length of the tree. This stage of defect is most prevalent in old stands, hence the cull percent increases sharply as a stand ages. According to several logging studies conducted by the Lake States Forest Experiment Station, primarily within the Chippewa National Forest in Minnesota, stand age and individual tree vigor both affect the amount of decay in aspen stands.

Satisfactory information on the relation of age and site to cull is not yet available. However, Anderson (*1*) in his yield studies of aspen in Wisconsin found that cull percent was highest on the poorer sites.

How much cull increases with age on good sites was shown (Figure 1) by several cull studies[2] in which all trees were felled and cull determined by regular Forest Service scaling practice. From these observations it is evident that the aspen yield reaches its peak at about 55

[2]Basis: Age 36 = 4 one-acre plots, age 43 = 5 one-acre plots, age 48 = 1 one-acre plot, age 52 = 1 one-acre plot, age 65 = 1 one-acre plot, age 78 = 1 one-acre plot. All the samples were taken on good aspen sites and in well-stocked stands.

years on good sites, and that merchantable volume recovery decreases rapidly thereafter.

That cull as well as growth is closely related to individual tree vigor within aspen stands was clearly demonstrated in a study of a 48-year-old stand on the Pike Bay Experimental Forest in northern Minnesota (Table 1). The stand was well-stocked and located on good site. A one-acre unmanaged plot, for which previous measurements were available, was chosen for the study. All trees within the plot were remeasured prior to clear-cutting and classified on the basis of a scheme suggested by Gevorkiantz, et al (*6*) which considers vigor, relation to surrounding trees, dominance, and crown density.

To get the most out of aspen it is of the utmost importance to watch the progress of the stands and harvest the crop before cull becomes serious. Although large sizes generally mean higher quality, it is impractical at present, to carry unmanaged stands past the age of 55 years (Fig. 2). To gain an inch on a few crop trees requires about 10 years. It is unlikely that volume losses will be offset by higher prices for larger trees, inasmuch as the risk of carrying them also increases rapidly with age. Large-size material should be produced by faster growth through management rather than through a longer rotation.

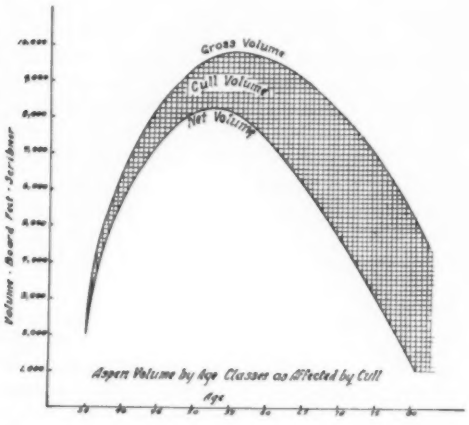

FIG. 1.—Volume by age classes as affected by cull. Volumes (Scribner rule) include all trees 7 inches d.b.h. and larger to a minimum top diameter of 6 inches inside bark for 100-inch bolts. Cull includes the entire volume of all 100-inch logs which were left in the woods because of excessive rot, as well as the actual rot in the merchantable logs.

Aims and Results of Management

Considering the vast areas of aspen type and the amount of material which goes to waste every year, the primary purpose of aspen management, should be to improve the quality of the growing stock and thus the final crop. Management for quality automatically will result also in greater quantity.

Aspen on the poorer sites is particularly susceptible to diseases. It grows more slowly, produces less volume and poorer products on these sites, and has a considerably shorter merchantable life span than on better sites. Management efforts, therefore, can best be expended on the good sites which will yield the most acceptable products.

At present it may be impractical for owners of large holdings to apply intensive management to their aspen lands. However, on such holdings, many of which at present lack even the crudest management, much can be gained by practicing extensive management. Aspen stands on most large properties consist of different age classes as a result of past fires. The acreage of each class may vary a great deal and thus present an irregular pattern for management. To develop an orderly marketing plan and reduce losses caused by defect and mortality it is necessary to work toward an equal distribution of age classes.

TABLE 1.—CULL PERCENT AND GROWTH IN RELATION TO TREE VIGOR

Tree vigor class[1]	Average cull	Average last 5 years' diameter growth			
		Dominant	Codominant	Intermediate	Suppressed
	Percent	*Inches*			
1	5	0.75	.....	.....	.....
2	17	0.55	0.36	.....	.....
3	20	0.50	0.29	.....	.....
4	35	0.46	0.30	.....	.....
5	50	.....	0.25	0.21	0.10

[1]Class 1—Progressive—comletely dominating surrounding trees.
Class 2—Progressive—competing with trees of same crown class but poorer development.
Class 3—Provisional—competing with trees of same crown class and development.
Class 4—Regressive—competing with trees of better development.
Class 5—Regressive—Suppressed, or definitely below average canopy.

The forest manager should first classify the area by site classes, then segregate the sites into approximate age classes, and from this information decide on a cutting policy. Because of the short life span, aspen on the poorer sites should be clear-cut at age of 30 to 35 years or as soon as it yields a merchantable crop. Overmature aspen stands should be cut at the same time. Next in line are the medium sites which should be cut at age 35 to 45 years, and good sites with mature stands of age 55 and older. Good sites carrying stands less than 55 years of age should come last because of the longer merchantable life of aspen on such sites. A balanced harvesting program of this sort is scarcely more difficult than indiscriminate cuttings. Furthermore it will pay generously in the form of more and better products, and pave the road to more intensive management.

Intermediate cuttings in aspen have, in the past, consisted primarily of cutting "from above" to certain diameter limits. This is poor practice. Aspen in the Lake States occurs essentially as even-aged stands. Hence the small trees in a stand are just as old as the large ones which would be cut on a diameter-limit basis. Trees in the lower vigor classes (and smaller diameters) are the most defective and the slowest growing (Table 1). Diameter-limit cuttings "from above," therefore, are simply high-grading in that they leave as growing stock the more defective portion of the stand. Since cull increases sharply with age (Figure 1) diameter-limit cuttings, particularly in stands approaching their peak volume production, will result only in loss of merchantable volume. Because the material most readily accepted by industry for high-value products is available only in sound trees of the larger diameters, it is evident that any partial cuttings attempted in merchantable aspen should be made *"from below"* in stands *under age 40* on *good sites.*

To what extent noncommercial thinnings will actually "pay" in terms of increased yields is not yet certain. That aspen responds exceptionally well to thinning, especially during early life, however, is clearly demonstrated by a number of thinning experiments on the Pike Bay Experimental Forest near Cass Lake, Minnesota. Compared with the check plots, the thinned stands are relatively free from hypoxylon canker (*Hypoxylon pruinatum*) and other visible diseases 10 years after thinning. This important factor in aspen management has also been observed in thinnings of young aspen stands in Canada (*3*). There are indications too that the rotation age, and thus the cull percent, may be reduced considerably through thinning. In a normal rotation, larger, sounder, and more valuable materials will be the final goal of early management. Thus, noncommercial thinnings may be justified for increasing vigor alone, as illustrated by the first 10-year results of thinning a dense 13-year-old stand (Table 2). The stand, of sucker origin, before treatment averaged about 3,600 spindly stems per acre. The site is good, with an index of 75 feet at 50 years.

As shown by these plots, young aspen responds quickly and well to thinning. The 5x5-foot spacing evidently was not wide enough and the stand 10 years later is definitely too dense. The 6x6-foot spacing has done well so far, but it too is now overstocked. The 10x11-foot spacing, on the other hand, was too wide to obtain optimum 10-year increment. However, the trees on this plot are growing rapidly and in time the stand will be well-stocked with large trees. The other two spacings appear very promising. Strictly from a financial point of view, the cords gained in these two spacings would pay for the cost of thinning if they were to be clear-cut for pulpwood now. For maximum volume of clear, high-grade products, the 8x9-foot spacing (Fig. 3) looks the most promising at present. It is of great interest that the basal area in all but the most severe treatment now exceeds the check plot in spite of the severe reduction in growing stock due to the thinning. Following the remeasurements at age 23 years, a commercial cut of 4½ cords per acre was made in each of the thinned stands. This cut was needed and the volume readily obtained in the 6-foot, 7-foot, and 8-foot spacings. It left these stands in excellent condition for future growth. In the 10-foot spacing the cut was not needed and it reduced the growing stock quite severely. In the 5-foot spacing, the cut was obtained with difficulty and the materials were small. A similar cut is planned in all the thinned plots 5 years hence. A commercial cut in the check plot at this time would have been possible only by removing trees in the upper crown classes.

Another noncommercial thinning experiment was made in a 20-year-old aspen stand (Table 3). The purpose here was to grow quality veneer logs in a short rotation. Consequently, the spac-

TABLE 2.—RESULTS OF THINNING YOUNG ASPEN TO DIFFERENT SPACING (PER ACRE)

Approximate spacing	After thinning (Age—13 years)			Ten year later (Age—23 years)				Net growth per square foot of basal area left		
	Average d.b.h.	Basal area	Volume[1]	Average d.b.h.	Basal area	Volume[1]		Basal area	Volume[1]	
Feet	*Inches*	*Sq. ft.*	*Cu. ft.*	*Inches*	*Sq. ft.*	*Cu. ft.*	*Cords*	*Sq. ft.*	*Cu. ft.*	*Cords*
3.4 (check)	1.6	53.9	610	3.0	66.7	1,257	7.37	.24	12.0	.14
5 x 5	1.8	30.3	372	3.2	77.8	1,479	10.50	1.57	36.5	.35
6 x 6	1.8	21.4	258	3.6	77.9	1,559	12.81	2.64	60.8	.60
7 x 7	1.9	18.9	242	3.9	78.1	1,559	15.87	3.13	69.7	.84
8 x 9	2.2	14.3	190	4.9	66.9	1,320	17.49	3.68	79.0	1.22
10 x 11	2.1	9.6	128	4.8	44.9	887	11.28	3.68	79.1	1.19

[1]Cubic-foot volume includes stump, stem, and top without bark. Cordwood volume includes merchantable peeled pulpwood to 3-inch top inside bark. No trees were large enough to produce any such material at the time of thinning. Each plot was *0.6* acre in size.

F. S. 392285

FIG. 2.—Overmature stand of aspen, 75 years old, on good site. Through mortality the gross volume had been reduced to 5,800 board feet. Because of rot the net volume, however, was only 2,000 board feet per acre.

ing was wider than desirable for other purposes. The site, formerly occupied by white pine, is between medium and good, with a site index of 70 feet at 50 years for aspen. The stands given 15-foot and 20-foot spacings are still understocked, and the trees in the 20-foot spacing are somewhat limbly above the first 16-foot log. It is evident, however, that the rotation in these two spacings will be shortened by at least 10 years, and that the trees then will be larger than in the uncut plot at normal rotation age. Nevertheless, the 10½-foot spacing now offers the best possibilities for management. The board-foot volumes present on all thinned plots now exceed those in the unthinned stand, and a pulpwood cut can be taken at this time without interfering with the original purpose of the thinning. A somewhat lighter thinning would have made possible such a commercial cut considerably earlier.

Considering the original purpose of the thinning, the 15-foot spacing may in time prove the best if intermediate cuts are foregone. The heavy thinnings needed to achieve spacings as wide as 15 and 20 feet cost so much, however, that regardless of the quality thus obtained it is questionable whether the additional income will repay the expenditure. The same quality can be obtained through somewhat closer spacings if provision is made for commercial thinning later on. The later commercial thinnings in turn will pay for the original expenditure for noncommercial thinning and subsequent management.

One of the interesting features of this experiment is the decreasing mortality rate with heavier thinnings (Table 4). The mortality is due partly to crowding, but primarily to hypoxylon canker which appears to increase with the stand density. Some preliminary studies have been made of this disease by Bier (*4*) and

F. S. 439564

FIG. 3.—At the age of 23, 10 years after being thinned down to 600 trees per acre, this stand contained 17½ cords of small pulpwood per acre to a 3-inch top diameter. The average d.b.h. growth was 2.7 inches. A commercial thinning at this age yielded 4½ cords of such wood per acre and left the stand in excellent condition for future development.

Gruenhagen (*7*), but much more needs to be known of its behavior, especially in relation to management practices.

In addition to the noncommercial thinnings in young aspen, a series of commercial thinnings were established in a 31-year-old stand with the object of growing high-quality aspen, but in such a manner that the stand improvement would pay for itself. The area, a former white pine-hardwood site, supported a fully stocked stand of aspen. The site is very good (site index 80 feet at 50 years). Three methods of cuttings were applied:

A. Medium cut from above, leaving all the understory and an overstory of 100 crop trees per acre. Removed 5.8 cords of pulpwood to 4-inch top i.b. and 2.9 cords of fuelwood to a 2-inch top i.b.

B. Medium cut from below, removing all but 300 crop trees per acre. Cut 3.0 cords of pulpwood to a 4-inch top i.b. and 11.2 cords of fuelwood to a 2-inch top i.b.

C. Heavy cut from below, removing all but 150 crop trees per acre. Cut 4.6 cords of pulpwood to a 4-inch top i.b. and 12.2 cords of fuelwood to a 2-inch top i.b.

Although 8 years is too short a period upon which to draw definite conclusions, the results (Table 5) demonstrates again the quick response of aspen to thinning. In treatment "A" the entire stand is growing well. The crop trees are developing as well as in any of the other plots without interfering with the production of pulpwood in the understory. This plot has already yielded one substantial cut of pulpwood and the understory is developing to the point where one or two more similar cuts can be made before the final harvest of the crop trees. In treatment "B" the growing stock is developing very well. The growth is excellent and increasing, and the canopy has closed well. It should yield another and considerably more valuable cut before the harvest of the final crop trees. In treatment "C" the growing stock was reduced too severely. The early mortality was heavy because of exposure and sunscald. The high incidence of sunscald in this plot compares with observations made of heavy thinning in Canada (*3*). The remaining crop trees are growing rapidly, but the crowns are not closing and brush covers the forest floor.

The choice of a method to be used in thinning an aspen stand depends largely upon the local market, but it should always be borne in mind that on suitable sites the best way to increase the utilization of aspen is to grow high-grade final products. Once management is started with this objective, nature will aid in shaping the stand, and future management will be relatively easy and cheap.

Regeneration

Inasmuch as aspen reproduces both through seeding and root-suckering, the reproductive capacity is enormous and accounts for the present well-stocked and even-aged stands. Aspen

TABLE 3.—RESULTS PER ACRE OF THINNING YOUNG ASPEN TO WIDE SPACING

Spacing	After thinning (Age—20 years)			15 years later (Age—35 years)					
	Average d.b.h.	Basal area	Volume[1]		Average d.b.h.	Basal area	Volume[1]		
Feet	*Inches*	*Sq. ft.*	*Cu. ft.*	*Cords*	*Inches*	*Sq. ft.*	*Cu. ft.*	*Cords*	*Bd. ft.*
4.8 (check)	2.7	74.8	1,294	7.89	5.6	72.4	1,838	23.10	1,010
10½ x 10½	3.9	31.3	616	6.38	6.6	69.6	1,846	24.11	1,836
15 x 15	4.4	20.4	407	4.59	7.5	47.8	1,197	15.70	1,582
20 x 20	4.6	12.9	254	3.02	8.5	37.3	964	12.02	2,075

[1]Cubic feet and cords calculated same as in table 2. Board-foot volume (Scribner) to 6-inch top inside bark. No trees were large enough to produce any such material at the time of thinning. Each plot was *0.5* acre in size.

TABLE 4.—FIFTEEN YEARS' MORTALITY AND NET GROWTH PER ACRE IN YOUNG ASPEN

Spacing	Mortality in 15 years			Net growth per square foot of basal area left		
	Basal area	Volume[1]				
Feet	*Sq. ft.*	*Cu. ft.*	*Cords*	*Sq. ft.*	*Cu. ft.*	*Cords*
4.8 (check)	51.3	972	5.55	—0.03	7.3	.20
10½ x 10½	10.9	237	2.99	1.22	39.3	.57
15 x 15	5.2	113	1.40	1.34	38.7	.55
20 x 20	3.6	79	.99	1.89	55.0	.70

[1]Volumes calculated same as in previous tables. Each plot was *0.5* acres in size.

begins to bear seed at the age of 20 to 25 years (*14*). Flowering usually takes place during the last part of April or first part of May and the seed ripens within 2 to 3 weeks after pollination. The seed germinates within a day or two when in contact with moist soil, but deteriorates rapidly if it falls on an unsuitable seedbed. Good seed years occur frequently and some seed is produced nearly every year. The fine-tufted seed is carried by the wind over great distances. During years when combinations of favorable factors occur, such as a good seedbed created by fire, adequate moisture conditions, and abundant seed supply, aspen stands will invade new areas.

Where aspen is present in a forest stand, regeneration most commonly is accomplished through root-suckering. The root suckers are produced by the dormant buds on the horizontal roots near the surface. These dormant buds, which are present in great numbers, are activated by the sudden strong light following removal of the parent stands (*2*). The suckers are usually produced in June. Under full sunlight they will attain a height of 3 to 4 feet by late fall. Root suckers may spring up over a radius of 30 feet or more (*9*) following the removal of an aspen tree.

Johnson, Kittredge, and Schmitz (*8*) explain that aspen probably occurred in the original forests only as scattered individuals. As cutting and fires removed these older stands, numerous aspen suckers came up and formed groups. Subsequent fires killed these groups and more aspen suckers came up from the established roots. Each new fire caused more suckering and the type spread rapidly. Shirley (*11*), besides recognizing the importance of suckers, also emphasizes the part played by seeding in the origin of aspen forests. No doubt a combination of seeding and subsequent spread by suckering following fire accounts for the presence of many of our pure even-aged stands of aspen.

Whatsoever role each of the two regeneration methods played in the establishment of our present aspen stands is primarily of academic interest. In actual forest management no certain means have as yet been developed to obtain aspen stands by natural seeding. Considering the comparative ease and cheapness by which fully stocked stands may be obtained through root-suckering, this method must be depended on for regeneration.

Many foresters believe that aspen always will reproduce abundantly through root-suckering following removal of the old stand. Examinations or many cutting areas in the Lake States, however, indicate that this is not always true.

Following fire or clear cutting where the entire stand is removed, aspen suckers generally appear in sufficient numbers to form fully stocked stands. However, unmanged stands, especially older ones, most often contain a considerable number of cull trees which the cutters are inclined to leave. When such trees are left, the suckers are less prolific and less vigorous. Moreover, the brush which thrives better than aspen in partial shade competes with and suppresses the aspen reproduction more severely where cull trees are left than on completely exposed areas. As a result, many stands that have followed the cutting of aspen, even on the best sites, will be poorer in stocking and productivity than the original stand.

The prerequisite for satisfactory aspen suckering is an abundance of sunlight. In any clear cutting it is imperative, therefore, that a thorough job be done in removing the old stand, whether the trees are merchantable or not.

The present condition of a stand of 11-year-old aspen suckers, resulting from cutting, (Table 6) illustrates the importance of competition upon the development of young aspen. The original stand was cut to various diameter limits in the late fall of 1935, at the age of 43 years, with

TABLE 5.—GROWTH PER ACRE AFTER COMMERCIAL THINNINGS IN 31-YEAR-OLD ASPEN

Treatment[1]	After thining (Age—31 years)					8 years' growth (Age—39 years)				
	Average d.b.h.	Basal area	Volume[2]			Average d.b.h.	Basal area	Volume[2]		
	Inches	*Sq. ft.*	*Cu. ft.*	*Cords*	*Bd. ft.*	*Inches*	*Sq. ft.*	*Cu. ft.*	*Cords*	*Bd. ft.*
A	4.8	67.3	1,875	20.5	203	1.1	20.1	679	12.3	2,414
B	5.9	53.9	1,376	17.8	668	1.4	23.8	863	11.1	3,738
C	6.1	30.1	780	9.7	233	2.1	8.6	521	8.3	2,989
Check	5.3	93.3	2,444	30.4	471	.8	11.0	640	9.5	3,392

[1]Based on plots 0.9 acre in size. Each treatment and the check had three replications.
[2]Volumes calculated same as in previous tables.

one clear-cut plot (Fig. 4) and one uncut check. The remaining stand on the partial cuttings was clear-cut in the late fall of 1941.

Owing primarily to the larger number of trees cut in the lower diameter-limit plots and, consequently, the higher light intensity, these became most heavily stocked. The height growth, too, is in direct relation to the degree of the original cutting. Only the dominants are of interest for future management. Except for the last plot, which had not formerly been cut, the suckers originating from the second cutting (1941) will be shaded out by those originating from the first cut in 1935. Had the plots not been clear-cut in 1941, most of the original 1935 reproduction would have succumbed to overhead competition.

The general opinion that clear-cutting of aspen always results in abundant regeneration is, among other things, based on the fact that most aspen logging in the past has been carried out during the fall and winter months. Good reproduction generally occurs after such operations, especially when the stands are not overmature and when a complete job of clear-cutting has been done. The increased demands for aspen during recent years, however, has resulted in a considerable trend toward summer logging as well. This is particularly true in the case of peeled pulpwood which must be produced in the early summer months while the bark "slips." Local observations and examinations in northern Minnesota show that aspen regeneration is to a large extent unsatisfactory on areas logged in the summer, even where the old stand was properly clear-cut. In many cases heavy brush is taking over the site (Fig. 5). These observations on the failure of summer-cut aspen to sucker vigorously agree with results of an experiment in Wisconsin (*12*).

There may be several reasons for these failures. It is possible that the aspen roots during the active growing season are depleted of their stored food and thus lack some of their ability to

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FIG. 4.—This vigorous aspen reproduction which became established after clear-cutting is now 11 years old and numbers 1,235 dominant trees per acre. The average height is 22.0 feet. In this clear-cutting, "cull" trees were cut down as well as merchantable ones.

produce vigorous suckers. Suckers produced during the same summer as the cutting become established so late in the season that most of them are winter-killed. When the logging is in late summer most suckering takes place the following year. In the meantime the brush species, which were present at the time of logging, have had time to recuperate and provide serious competition for the newly established aspen suckers.

In order to obtain some information on the regeneration resulting from logging during various seasons, a survey was made of several typical clear-cut areas on the Pike Bay Experimental Forest, Minnesota, in 1945. The aspen stands were about 50 years old when cut. Counts and measurements were made, both of aspen suckers and of brush. A record was also made of the aspen suckers which had died, evidently as result of competition. The areas logged in the summer produced far less reproduction than those cut in the winter (table 7). Spring logging (the last half of April and first part of May) resulted in somewhat less reproduction, which evidently became established during the first summer and thus attained a greater height than the suckers resulting from summer logging of the same year. Conditions within the two areas are comparable. The brush is quite heavy. In the summer-logged part of Area No. 1, (Table 7) the surviving reproduction has barely managed to keep abreast of the brush and the mortality is heavy. In the winter-logged part of the same area the more numerous and vigorous suckers have kept well ahead of the brush and probably to some extent helped to hold it back.

It is recommended therefore that final cuts of aspen on good sites be made between October and April, so far as practicable. Summer cutting should be concentrated on sites where reproduction of aspen is not desired, such as areas stocked with an understory of balsam fir.

Where aspen fails to reproduce following the final cut, the forest manager can help. Since full sunlight is needed to start and fully develop the reproduction, the final cut must remove all of the overstory, including cull aspen and other

F. S. 434938

FIG. 5.—On this area the mature aspen was logged in summer. Aspen reproduction did not become properly established after logging and brush species have now taken over.

species of inferior quality. If reproduction fails to become satisfactorily established due to other causes, such as summer logging, overmaturity, or dense brush cover, more drastic measures must be taken.

The present extensive stands became established primarily as a result of fires. Fire, however, as a tool in human hands, thus far has not been used to obtain aspen regeneration. Moreover, Stoeckeler (*13*) shows that past fires have deteriorated aspen sites. In a search for a practical solution to this problem, a cut-over area on the Pike Bay Experimental Forest was crossdiked in the early spring with an Athens-type disk plow. The area chosen had been logged in summer 3 years previously. It was extremely brushy and had a scattered overstory of cull aspens. A survey prior to disking showed 61 percent of the mil-acre quadrats examined to be stocked. There were 750 aspen sucker clumps per acre. When the area was re-examined in the fall following disking, it had a stocking of 91 percent of new aspen suckers, or 2,400 sucker clumps per acre. The stocking inside a 50-foot radius of standing cull trees was 100 percent with 5,300 sucker clumps per acre resulting from disking. In this case there evidently were sufficient aspen roots (probably from standing cull trees and existing reproduction) in the ground to assure a well-stocked stand of aspen reproduction. No doubt, elimination of the competing brush also helped.

Because disking was done two or three years after logging the slash had decomposed enough so that it did not seriously hamper machine operation. Unquestionably, if disking is done sooner after logging the aspen reproduction will be denser and more vigorous and less time will be lost in growing the new crop.

Occasionally foresters ask whether second-growth resulting from suckers will make as good trees as those in the parent stand. The high mortality rate among young suckers and the wood discoloration found in a great number of stems raises a question as to whether rot in the parent stand is transferred to the roots of the suckers. Possibly this may occur, but the suckers, as they become established, form their own root systems and no longer depend on the parent roots for their food. Schmitz and Jackson (*10*) found no evidence to prove that suckers are infected by the parent stump through the roots. In any event, most merchantable stands contain a certain number of trees that are vigorous and rot-free. It is expected that these, at least, will produce rot-free suckers.

TABLE 6.—EFFECTS OF OVERHEAD SHADE ON YOUNG ASPEN SUCKERS

Treatment[1]		Suckers per acre			
1935	1941	Origin		1946 dominants only	Average height 1946 (ft.)
		1935	1941		
Clear-cut	.....	6,830	.....	1,235	22.0
Cut to 8-inch d.b.h. limit	Clear-cut	4,500	300	665	19.4
Cut to 9-inch d.b.h. limit	Clear-cut	2,115	815	565	17.4
Cut to 10-inch d.b.h. limit	Clear-cut	1,980	1,180	465	13.8
No cutting	Clear-cut	.....	5,800	930	9.5

[1]Each treatment was carried out on a 2-acre plot.

TABLE 7.—ASPEN REPRODUCTION AND BRUSH DEVELOPMENT FOLLOWING CLEAR CUTTING DURING DIFFERENT SEASONS (PER ACRE)

Season of logging	Aspen clumps	Living stems	Dead stems	Average height aspen	Brush stems	Average height brush
	Number	*Number*	*Percent*	*Feet*	*Number*	*Feet*
Area No. 1						
Summer—1941	750	1,250	40	6.4	30,800	6.0
Fall—1941	3,400	6,100	40	6.9	23,300	5.0
Winter—1941	5,850	11,850	21	6.6	12,850	3.5
Area No. 2						
Spring—1943	4,100	8,550	8	6.4	10,750	3.1
Summer—1943	2,750	4,700	8	3.2	8,400	2.7
Winter—1943	7,100	22,850	2	4.4	9,500	3.0

In an attempt to determine the incidence of decay in aspen suckers, two stands of sucker origin on good site, 11 and 23 years old, were examined for wood discoloration which may be an indication of incipient rot. A strip was cut at random through each of the stands, and each tree was classified as to dominance and degree of discoloration. In the 11-year-old stand it was found that of a total of 4,800 stems per acre, the wood of 2,210 stems was unaffected by any stain whatever. Of the latter, 39 percent were classed as dominant trees. In the 23-year-old stand there were 3,100 stems per acre. Of these, 1,015 were free of discoloration, and of that number 38 percent were in the dominant class. To what extent discoloration is an indication of rot is not known. It is clear, however, that trees without discoloration are still free from rot. In both stands there were more than enough rot-free trees in the dominant classes to assure fully stocked stands.

Aspen reproduces well if we follow the simple rules laid down by nature for the establishment and development of this intolerant species.

Continuation of the past harvest methods in the management of natural stands under which only the best trees are cut will, however, result in what some Scandinavian foresters so pointedly term "the green lie." The value of the stands will continually deteriorate. Better knowledge is available, but if we do not use it the next generation shall be deprived of the quality and management possibilities that were handed down to us, even on our best aspen sites, and more brushland will be added to an already overwhelming planting job.

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Notes

Frozen Red Pine Planting Stock Shows Fair Survival

During the summer of 1947, R. V. St. Amant, then forest ranger on the Superior National Forest in Minnesota, planted some 2-1 red pine which had been put into freezing storage soon after lifting that spring. His object was to find out whether dormant stock so handled could be planted successfully during the height of the growing season. Although the results have been somewhat erratic, they suggest that the use of planting stock kept dormant by freezing may have possibilities as a method of prolonging the planting season.

The procedure used was as follows: On May 1, a crate containing about 800 trees packed in sphagnum moss was doused with water and placed in a meat refrigerator at 14° F. At the same time about 200 trees which had been left over in the planting boxes at the close of the day were wrapped in moss, soaked with water, and placed on top of the crate. The second lot of stock had possibly been subjected to some drying, but otherwise the two lots were comparable. Both had been lifted at the Eveleth (Minnesota) nursery in late April and were in a completely dormant condition.

On June 15, 1947, the 200 trees in the bundle on the top of the crate were removed from storage, thawed by soaking in water for one-half hour, and planted. On July 15, the crate of 800 trees was taken from the refrigerator. Planting had to be delayed for almost three days as the stock was enclosed in a block of ice. When finally thawed out, the trees were planted about an inch apart in rows in a sandy loam soil some 25 miles from the first lot. Most of them began to grow, and they looked very good until after the first hard frost in mid-September. From that time on the trees showed a great deal of browning, apparently the result of freezing of the as yet unhardened growth. The June planting, on the other hand, was practically a failure.

Survival counts made at the end of the second season showed 61 percent of the stock planted in July still living compared with 11 percent for that planted in June. These results are not strictly comparable, however, for the lots of stock had not received exactly the same treatment prior to and during storage and, moreover, two different planting sites are involved.

Of more importance than the survival data is the fact that red pine stock can be frozen and planted in the middle of the growing season, and still show fair survival. Since most of the loss was apparently due to frost injury, even better survival would likely have resulted had the second planting been done two to four weeks earlier to give the trees ample time to harden off. Some additional advantage might have been gained by freezing the stock immediately after lifting rather than three or four days later.

Although the planting of such stock seems to have possibilities, it should be pointed out that more study will be necessary before any large-scale application of the method could be safely put into practice. The variables in an experiment of this kind could include species, class of stock, length of storage period, temperature during storage (this is an important factor in the cost of storage), and possibly humidity during storage.

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Some Relations Between Soils and the Littleleaf Disease of Pine[1]

The disease affecting shortleaf pine (*Pinus echinata* Mill.,) known as littleleaf, continues to result in heavy losses to this species in many parts of the Piedmont region of the Southeast.[2] At the present time, much work is concentrated towards establishing the cause or causes of this disease.

The object of this study was to determine by survey if any relationship existed between soil associations and the incidence of littleleaf on the 12,000-acre Calhoun Experimental Forest, located near Union, South Carolina.

The survey was based upon counts of diseased and healthy trees on circular ¼-acre plots

[1]The author gratefully acknowledges the assistance of Peter W. Fletcher of the Southeastern Station, and Jackson Bennett of the Soil Conservation Service in offering assistance and providing maps throughout this investigation.

[2]Hepting, George H., Thomas S. Buchanan, and L. W. R. Jackson. Little leaf disease of pine. U. S. Dept. Agric. Circ. 716. 15 pp. 1945.

chosen so as to give a good representation of the more important soil associations on the forest. Aerial photographs of the forest with a soils map superimposed thereon, were used for orientation and location of the plots, followed by field identification of the soils listed in Table 1.

Sampling procedure requirements were established to provide a minimum of 25 plots on each soil association and a minimum distance of 100 yards between plots. Other requirements were as follows: all pines counted in the survey must measure 5 inches d.b.h., or larger; all plots must have at least 25 such trees, of which at least 50 percent must be shortleaf in the dominant or codominant crown classes.

Survey data taken on each plot included soil association, percent of slope, erosion class, number of shortleaf pines, and number of shortleaf pines affected by littleleaf.

A fairly complete coverage of the forest was obtained. The results of the survey (Table 1) show that the incidence of littleleaf varied with soil associations. Statistical analysis of the survey results shows that only two differences of disease incidence of all possible comparisons are not significant. All other differences in disease incidence are significant either at the 1-percent or 5-percent levels.

A comparison of the data obtained from this survey and those obtained from a survey of littleleaf in Alabama in 1941,[3] is provided in Table 2, and shows very close agreement in incidence of littleleaf for comparable soils.

The South Carolina survey failed to show any relation between erosion classes or slope groups and the incidence of littleleaf. This is not unexpected since the classifications for erosion and slope are rather broad when applied to forest soils.

Upon examination of Table 1, it is apparent that the percentage of littleleaf trees increases as the internal drainage in the respective soils studied becomes poorer. Thus the relation of littleleaf to soils seems to be associated with their internal drainage. Under conditions of poor internal drainage there are many adverse physical, chemical, and biotic conditions that might, in one or more ways, be responsible for littleleaf. This being the case, on certain of the better drained soils pines may be grown until mature, while on the less well drained soils, an

[3] Boggess, W. R., P. A. Swarthout, and E. R. Toole. Results of the survey on the littleleaf disease of southern pines in Alabama. Alabama Agric. Expt. Sta. Departmental Mimeo. 15 pp. 1941.

TABLE 1.—INCIDENCE OF LITTLELEAF ON CERTAIN SOIL ASSOCIATIONS ON THE CALHOUN EXPERIMENTAL FOREST

Soil associations	Internal drainage	Plots	Total trees	Littleleaf trees	Standard error
		Number	*Number*	*Percent*	
Cecil-Madison	Well-drained	50	2171	6.4	± .76
Davidson-Lloyd		42	1517	10.5	±1.06
Appling-Durham		25	911	14.7	±1.70
Cataula	Less well-drained	46	1721	16.7	±1.22
Helena-Vance		49	1880	21.6	±1.48
Wilkes		47	1702	25.1	±1.86
Enon-Mecklenburg		46	1972	30.7	±1.51

TABLE 2.—A COMPARISON OF THE PERCENTAGE OF LITTLELEAF ON COMPARABLE SOILS FROM SURVEYS IN SOUTH CAROLINA AND ALABAMA

South Carolina		Alabama	
Soil associations	Littleleaf trees	Soil series	Littleleaf trees
	Percent		*Percent*
Cecil-Madison	6.4	Cecil	2.1
		Madison	23.7
Davidson-Lloyd	10.5	Lloyd	11.5
Appling-Durham	14.7	Appling	18.7
Helena-Vance	21.6	Vance	22.4

early harvest of the trees may be necessary. Also, further consideration may have to be given to the use of other species capable of withstanding such conditions.

Summary

Results obtained from a survey of 305 one-fourth-acre plots on an area near Union, South Carolina, indicate a close relationship between the incidence of littleleaf disease and soils. Internal drainage of the soils appears to be a major factor involved in this relationship.

OTIS L. COPELAND, JR.[4]

[4]Division of Forest Pathology, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture, in cooperation with the Southeastern Forest Experiment Station, U. S. Forest Service, at Union, S. C.

The Pole Diameter Tape

Determination of the Girard form class requires a diameter measurement at the top of the first 16-foot log on each tree. This is a slow, often hazardous, procedure when a ladder is used or trees are climbed. The Ferree pole calipers[1] are a great improvement, but in Alaska's coastal forests, where the terrain is often steep and rocky and trees are too large for small calipers, the job is more difficult. A light, easily handled, compact "pole diameter tape" reduces the task to a very simple and fast procedure. It consists of a 14½ foot conduit tubing with an ordinary diameter tape mounted to run through the tubing, having a wire with a hook on the end for the actual measurement.

The operator determines the correct height by known distances on the pole, catches the hook in the bark, walks around the tree, and reads the diameter directly from the tape. An opening in the tubing near eye level permits reading the tape to the nearest tenth inch. A slight touch from the end of the pole releases the hook and the tape can be wound up. One man can measure and record the necessary data on about 150 trees per eight-hour working day.

Construction of the Pole Diameter Tape

The materials used in construction are two 10-foot sections (maximum length) of one-half inch E.M.T. conduit tubing, 14 feet of stainless steel, braided wire, a small grab hook, swivel joint, hose clamp, and an ordinary diameter tape. The total cost of materials, excluding the diameter tape, is less than $3.50.

The top of the tubing is bent on about an 8-inch radius, using the special wrench for this material. The two pieces are then joined together by sawing a 10-inch section from the extra length, splitting the section and spreading it to go around both pieces. The coupling is welded to the lower piece and a hose clamp placed on the upper section so it can be broken down into short lengths for transporting and storage. Thirteen feet from the top an opening is cut into the tubing, 3¼ inches in length, to read the tape (*c*). About 6 inches below this opening the diameter tape is set down into the tubing and held fast by a metal strap (*c*). It is necessary to turn the diameter tape over and rerivet the inside end in order to have the diameter side up in the tubing. Then the stainless steel wire is attached to the outside end of the diameter tape, in place of the hook, using a long splice. About 4 inches from the end of the tape a small swivel joint is put in the wire to

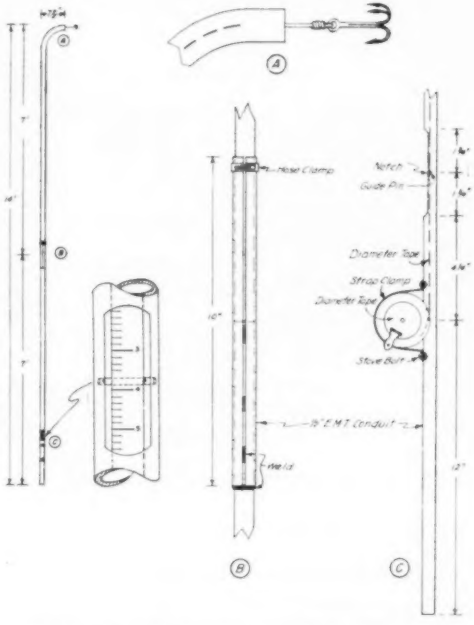

FIG. 1.—Plan for constructing pole diameter tape.

[1]Ferree, M. J. The pole caliper. Jour. Forestry 44: 594-595. 1946.

offset the twisting effect of the wire on the tape. The wire is then carried through the tubing and attached to the grab hook. Calibration consists only of filing a notch in the center of the opening in the tubing, pulling the wire through until the zero on the diameter tape is even with the notch, and attaching the eye of the grab hook to the wire even with the end of the tubing.

When measuring the diameter the end of the tubing should be even with the eye of the hook and the diameter is read at eye level. A guide pin, made from a small nail, is put through the tubing to raise the diameter tape for easy reading. The total weight of the assembled pole, as shown in Figure 1, is slightly over five pounds.

R. M. GODMAN,
Alaska Forest Research Center.

A Crown Density Scale for Photo Interpreters

One method of estimating gross volume of timber stands from air photos requires the measurement of tree height, crown diameter, and proportion of area covered by tree crowns. The estimates of this proportion of crown coverage made by trained photo interpreters, using the crown density scale described below, seldom vary by more than 10 percent.

This scale (Fig. 1) consists of three columns of squares containing black dots that cover from 5 to 95 percent of the area of the squares. The dots in the two outside columns are randomly distributed while those in the center column are mechanically spaced. The area of each square equals one acre at the scale of 1:20,000 photos. At this scale the dots approximate the size of visible crowns of the average mature hardwood tree.

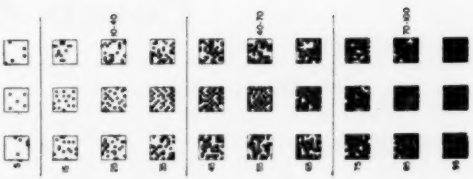

FIG. 1.—Crown density scale. The numbers opposite the squares show the percent of crown cover.

For most effective use, the scales are trimmed on each side close to the figures. The interpreter orients his photo-pair under his stereoscope, and places the scale on the photos perpendicular to the line of flight and between the eyepieces of the stereoscope. He can see the scale in this position, and can also view the photos in stereo. By adjusting the position of the scale, he can determine which square most closely resembles the crown pattern of his plot. The number opposite this square is recorded as the proportion of crown coverage. To assure an accurate determination, care must be taken to compare only tree crowns with scale dots and to discount all shadows.

Prints of the crown density scale can be secured through the Engineering Office, U. S. Forest Service, Washington 25, D. C.

KARL E. MOESSNER,
Central States Forest Experiment Station.

Erratum

In the April issue of the JOURNAL OF FORESTRY page 264, second column insert after line 12 the line "reductions in the size of the average new house."

Points of View

The Ranger Schools

Should the short courses in forestry, the so-called ranger schools, be discontinued? Is there any place in the forestry profession for practitioners with less than college training? Is it fair to turn young men loose in this diploma-filled world without a degree?

As a graduate of one of the best of these schools, who finds himself at age forty-five with no place to go in his chosen profession, the writer's answer to the latter question is a resounding "No!"

The ranger schools were originally established, as their literature will tell you, "To fill the gap between the professional forester and the lumberjack; to provide corporals and sergeants in the forest army." In those days, graduate foresters were scarce. Their talents were needed in the formation of policy and large scale planning. It was a waste of their time and abilities to supervise the routine collection of data and direct unskilled personnel.

Today, this situation no longer exists. The short-course graduate has difficulty in securing a position at all, and his chances of promotion to a post calling for satisfying responsibility and salary are quite limited.

Two factors have brought about this change. The first is the mass production of college graduate foresters. This is so great that, in spite of the probable need for them, the funds available for salaries in all fields are simply not enough. At graduation, most of them have to take jobs once filled by men with less training, or abandon their chosen career.

A prominent forestry educator once remarked with foresight that it was all right to train "sergeants and corporals" for the profession if such men knew their places. Today the situation is reversed, it is the captains and lieutenants who are taking the places once held by the non-coms. Who would not hire a sergeant with a captain's education, if he can get him for the same money?

Nor is there any reason to believe that this flood of college graduates will stop of its own accord. And, in a free country, it should not be artificially damned.

The second important factor that has made the short-course graduate an orphan is the change in attitude of employers and the public toward the college trained forester. The young whippersnapper has proved his worth in the woods. This is a credit to his training as well as to the lad himself. He may have to be taught how not to be a liability to a field party the first six months, but by the end of the year he is likely to be directing that same party.

This change of attitude, which applies very generally and includes almost all fields of endeavor, is reflected in tightening restrictions for civil service positions in all branches of government. Today, the ranger school graduate is behind an almost insurmountable obstacle in any situation where he has to get on a classified list, except for very minor posts.

If the colleges are doing their work well, these provisions are wise. Most government positions should be filled by men with a broader concept of economics and human relations than it is possible to teach in a short course.

It follows, therefore, that in the three major branches of forestry employment—teaching, government, and private management—a ranger school graduate is at a disadvantage in all but one, private employment. James F. Dubuar, director of the New York State Ranger School, one of the most active champions of ranger school graduates, reluctantly admitted this fact during the 1947 meeting of the New York Section.

But how good are the opportunities in private forestry? At present a few large operators are undertaking long range sustained-yield programs and hiring foresters to conduct them. But how long will the profits last that make this possible? How long will these big companies continue to pay out money for technical advice in forestry which every one else gets free from government-paid foresters? Probably until they no longer have to do so to keep their corporate income taxes down.

And more pertinent to our problem, how long will they continue to hire ranger school men when they can get college graduates? If the big engineering firms are any criterion, and there are many similarities, it won't be long. Now that the supply is bountiful, these firms are insisting on, and getting, college graduates for draftsmen.

The final argument, which the short-course

advocates present, is that it gives a man of limited means training he could not otherwise obtain. This is true of course, but could be likened to providing daily nursing service to the poor man in his home, and sanitorium rooms for the wealthier. If the state has an obligation to educate its citizens, and few argue the point, then the obligation is to give all its citizens all the education they can absorb. Continuing short courses in any subject is merely postponing the ultimate objective.

In closing, the writer would like to emphasize the potential value of the ranger school type of training as an adjunct to a four- or five-year college course. What Henry I. Baldwin of New Hampshire wrote in his recent article in the JOURNAL OF FORESTRY, concerning the effects of urban environment of foresters in general, applies with equal force to forestry education.

The ranger school type of training does what the brief summer camps cannot possibly do. It teaches a man how to work, how to protect himself and his fellow workers, and how to relax in the woods under all weather conditions and over a long period of time. Also it teaches habits of concentration and sustained effort that most college men do not learn until they take their first job after graduation.

With minor changes in curriculum, most ranger school courses would make unexcelled first years for a college degree.

JAMES HUNTINGTON MANROSS,
Syracuse, N. Y.

"Is a Management Cruise Really Necessary?"

December 20, 1948

Dear Mr. Gevorkiantz:

I am greatly interested in the article, "Is A Management Cruise Really Necessary?" in the December JOURNAL OF FORESTRY. Mr. Hawes states: "The first job that comes to his [the forester's] mind is a type map and an inventory."

I plead guilty and we have made such inventories for three of our ten forest compartments. The cost is considerably more than five cents an acre, but the foresters who do this work also establish new and remeasure old growth plots, take photographs of various types of forest stand. We now plan to make a strip tally inventory in each compartment preceding the management plan of tree marking and the cutting budget.

Mr. Hawes advocates aerial photography in lieu of the strip tally cruise. I will greatly appreciate your advising me as to how I can obtain estimates of the cost and description of the method of interpretation of aerial photographs of our forest land. Also what commercial firms are available for work in this region? Would the aerial photographs present sufficient cover data for the forestry department to proceed with our second cycle tree marking and future cycles also?

I am asking this of you instead of writing to Mr. Hawes because he is talking about Southern pine forests and you are familiar with the hardwood-hemlock forest cover intermingled with swamp, cordwood and incipient reproduction areas and the many other forestry aspects of mensuration in the Lake States.

R. B. GOODMAN,
Goodman Lumber Co.

January 10, 1949

Dear Mr. Goodman:

I, too, was perturbed by Mr. Hawes' article which appeared in the last issue of the JOURNAL. However, my chief concern was not with what he said, but rather with what he did not say or failed to mention. I think we all agree with him that it is indeed deplorable to make management cruises when there is only "a vague notion of what will be done with the end results." However, not many of us will admit that most of our forest managers are as naive or plainly stupid as the author would like us to believe. What worries our practical men is not whether the so-called management crusies are necessary, but rather *what type of cruises and when are they really needed.*

To begin with, one cannot really manage any piece of forest land without knowing what is on it or what kind of treatment it requires. This is especially true when one has a sizable tract of timber which is tied-up inseparably with the mill requirements. When, as in your own case, the main problem is to sustain maximum annual cut that would both keep the mill going and maintain the growing stock at an optimum level, one clearly needs factual information to decide *how much* to cut, *how* to cut, *where* and *when.*

Naturally, we need not employ all sorts of

"fancy" cruises nor make them too often. The truth of the matter is that there are no stereotyped management cruises. They will vary in intensity and method, from a reconnaissance to a comprehensive study, depending on the type of information needed and the problems involved. However, no matter how you look at it, it is obvious that, if good management can save about 2 percent of the timber value annually through salvage and another 2 percent through improved growth, it is not extravagant to spend less than ¼ of 1 percent for inventory work which alone can provide a factual basis for the management plan itself. Unfortunately, Mr. Hawes forgot to mention this.

Now a few words about the application of aerial photography. While the photo interpretation work is often invaluable for making quick bird's-eye analyses of general forest possibilities, in making base maps, type maps, size-class maps, in locating roads, etc., it is not a substitute for ground surveys. When it comes to intensive management involving closer evaluation of such items as volume, growth, defect, and vigor of the growing stock, one needs detail which he can only get at the ground level. Surely by now you must have all sorts of general information in regard to your forest property. If you still need good maps, perhaps you would benefit by getting aerial photos. There are a number of companies who will photograph your forests from the air at approximately $3.80 to $5.00 per square mile, such as Abrams of Lansing, Michigan, Mark Hurd of Minneapolis, or Jascoviac of Eveleth, Minnesota. Mr. Martin, I am sure, knows about the Marinette County aerial photos adjacent to your property. I also understand that the eastern portion of the Nicolet National Forest will be flown sometime next summer. This photography could probably be extended over your properties at a very reasonable contract price by immediate arrangements with the Regional Forester at Milwaukee. Individual prints may be obtained of any existing photographs at much lower prices, through the Abrams Company, or U. S. Forest Service.

In conclusion, I feel sure that Mr. Hawes did not have in mind any such intensive management work as you do on your forest. Of course, he has a point and we all recognize that surveys can be overdone. We only want information that is absolutely essential for setting up the management plans. The type of information needed must be strictly related to the prime aim of management and the surveys planned with an eye toward efficiency and economy. This, in a nut-shell, means proper use of modern sampling techniques.

S. R. GEVORKIANTZ,
Silviculturist.

Reviews

The Forestry Directory. Compiled by Tom Gill and Ellen C. Dowling. 420 pp. American Tree Association, Washington, D. C. 1949. $3.

Sixth in a series begun with the *Forestry Almanac* in 1924, and the latest edition since 1943, the new *Forestry Directory* is unique in American forestry literature. Within its covers is a comprehensive digest of the development and present status of forestry in the United States and Canada. Listed and described are all the hundreds of governmental and public agencies, scientific societies, conservation and trade associations, educational and research institutions, and other organizations engaged in the practice and promotion of forestry. In addition, a brief but useful chapter on international forestry is included. It is as packed with useful information as a pine cone is with seed.

Time was when the well-informed forester could keep in his head, or in a loose-leaf notebook, most of the information he occasionally needed about who was doing what in which forestry organization. But no longer. As professional forestry approaches the half-century mark, it has become a many-branched growth spreading out into American life and American institutions in a manner marvelous to contemplate.

No previous edition has covered so broad a scope as this one. It is quite evidently the fruit of a prodigious amount of labor in compiling the myriad minutia of the forest conservation movement from *Acquisition, Land* to *Zoological Society, New York.* And if there is one trend discernable above all others in this excellent volume, it is that forestry is no longer an ideology preached by a few enthusiastic public agencies, schools, and associations; it has become a way of life with roots deep in education, culture, government, and industry, and vigorously supported by institutions as diverse as the D.A.R. and the C.I.O.

Although the *Directory's* foremost utility is as a reference work, the book has another value which merits mention—it is a perfectly fascinating storehouse of information to browse around in. For example, one may discover that California leads all the states in her appropriations for forestry, that the Association of State Foresters has 50 members (how come?), that the familiar term "tree farm" was first used in 1941, that naval stores produced from living-trees are gum naval stores whereas those produced by other means are called *wood* naval stores, etc., etc.

The richness of information available in these 420 pages gives one a comforting and exhilarating sense of the vitality of forestry in America.

HENRY CLEPPER.

The Economic Problems of Forestry in the Appalachian Region. By William A. Duerr. 317 pp. Illus. Harvard University Press, Cambridge, Mass. 1949. $5.

It is a source of gratification to the reviewer that forestry economics has progressed to the point where such a stimulating and well-written treatise could be published. Despite the author's statement that "the field of forestry economics is still largely unformed," his analysis has contributed much toward giving shape to the field.

In a preface he states, "This book is aimed at defining the field of the economics of forestry and outlining the economic problems of forestry as background for research. Its ultimate purpose is to aid in solving the forestry problems of the people by encouraging better understanding and more pointed research in attacking these problems. The book deals specifically with the Appalachian Region—the five southern Appalachian states of Kentucky, North Carolina, Tennessee, Virginia, and West Virginia—in the years adjoining 1940. But the theoretical issues proposed have wider applicability, and the point of view taken may be of general interest to those concerned with forest-resource management. In a sense, therefore, the Appalachian Region and the context chosen are used merely for convenience in providing concrete illustrations of principles."

The book adheres well to these purposes. It should be of interest to all foresters; it contains more good practical forestry than theoretical economics, although there is a liberal sprinkling of the latter. Not all foresters, nor all econom-

ists, would choose Duerr's method of expressing the problems of forestry in terms of "maximum total economic welfare," but few would sugggest that a detached problem analysis such as he attempts should be made from any other point of view. The day of the one-sided emotional "forestry movement" is fast passing; to justify a place in the general economy forestry must be considered in relation to all other segments of industry and the entire population.

After a concise description of the Appalachian Region with respect to its physical and industrial resources, Duerr discusses the economic problems of forestry as maladjustments of (1) people and the land; (2) forest-land management; (3) timber management; (4) marketing of timber products; and (5) consumption of forest products.

Among the problems associated with population and general land use Duerr considers the "high ratio of population to resources" as the key to a chain of problems springing basically from "underemployment of rural people" which produces dislocations of agriculture over the entire region, of mining in the highland areas, and of "rural-industrial relations" that are "especially acute in the southern piedmont and in the Tennessee and Kanawha valleys." These problems, intensified by a resultant low level of education and public health, all impinge upon forestry; until they are solved there will be economic problems of forestry.

The economic problems of forest-land management arising out of the foregoing maladjustments Duerr enumerates as (1) uneconomic allocation of land and other factors of production to major uses; (2) uneconomic distribution of forest land among different forest uses; (3) uneconomic size of land holdings; (4) operation of the pattern of ownership in deterring full use of forest resources; (5) uneconomic use of farm woodland resulting from conditions of farm tenancy; (6) misuse of forest land owing to inequities of forest taxation and tax delinquency; (7) impoverishment of forest land by fire and other destructive agencies; and (8) uneconomic allocations arising from public conventions and programs affecting land use and resource management.

Most of the foregoing land problems are generic; they affect the management of the other resources of the forest as well as commercial timber. Those problems applying more specifically to timber management Duerr discusses under the following main headings: (1) long period of production; (2) confusion of capital equipment (growing stock) and product; (3) silvicultural condition of the forests, especially deficiencies in quantity and stocking of timber and deteriorated site conditions; (4) timber-management practices, including inferior cutting practices, need for planting, and the effect of the "insecure financial position of forest owners" upon these practices; (5) disadvantages of the farm-forest relationship, comprising the traditional attitude of farmers toward forests and their inadequate knowledge about them; and (6) continued, though diminished, incentives to liquidate industrial forests.

Apparently the author considers the problems of marketing the most important, since he devotes more than one-third of the book to this subject. In fact, he states that "marketing is the focal point of the entire process of forestry," and it is therefore not surprising that the list of such problems is long. Some of these problems are associated with certain peculiarities of forest products that differentiate them from other commodities in marketing: (1) the variety of products; (2) the inadequacy of timber grading; (3) a variety of poorly organized markets; (4) many small primary and secondary producers; (5) maintenance of credit functions and market controls in the higher stages of production; (6) low value of timber products; (7) unspecialized organization of small marketing agencies; (8) spasmodic nature of timber markets; and (9) little product differentiation.

Another group of problems is laid at the door of "inherent handicaps of the small owner": (1) minor position of the timber enterprise; (2) seller's unfamiliarity with the market and with timber products; (3) seller's handicaps in harvesting and preparing products; (4) brief time devoted to timber marketing; (5) prevalence of disadvantageous marketing methods; (6) small scale of seller's operations; and (7) seller's unfavorable financial position.

The buyer's side also generates problems: (1) competitive position of buyers; (2) confusion in use of different units of measures; (3) price and freight-rate structure and difficulties engendered by the contractor system in the pulpwood industry; (4) inefficiencies of small sawmills; (5) dominance of the concentration yard in the pine lumber market; (6) position of the region in the general market; and (7) importance of products consumed locally.

Finally, Duerr considers the following as maladjustments in the consumption of forest products: (1) those arising from the rival relationship between wood and other goods; (2) uneconomic practices in use of wood by timber owners; (3) problems of wood procurement by industrial agencies; (4) difficulties of predicting a dynamic demand; and (5) effects of public programs upon wood consumption.

Readers of this book should not be disappointed that the author does not give answers to these problems; if the answers were available the problems would not exist. Duerr's knowledge of the Appalachian Region, gained from personal observation and familiarity with a large body of literature cited in the book, is reflected in his thoroughgoing analysis. And his training as a forester and as an economist enables him to suggest a number of logical ways in which these problems may be attacked .

ROY B. THOMSON,
Duke School of Forestry.

❦❦❦

Authority in TVA Land. By W. V. Howard, 186 pp. Frank Glenn Publishing Co., Inc., Kansas City. 1948.

"To the America of today, the proper course of action seems to be to abolish the Authority, retain its contributions to the idea of regional development of water resources, turn its useful functions over to existing agencies and write the remainder off the books as a necessary cost of experience."——This is the rather succinct conclusion quoted from the latest *appraisal* (italics mine) of the Tennessee Valley Authority.

This book opens with the stated intention of presenting the facts regarding the TVA and its operations. However, it quickly deviates from this laudable intent and degenerates into another poorly aimed and confused attack on the authority and many of its concepts. This is unfortunate. The reviewer believes that the intelligent people of the United States are, or soon will be, due an impartial analysis of the TVA program and its implications. There are many things at stake. Certainly this book will not meet the requirements of such a needed analysis. That job is too big and too complex to be satisfied by a small, thin book which is partially filled with sarcasm and inane comparisons.

The book discusses successively the cost of TVA; Tennessee River navigation; flood control effectiveness; power production, distribution and use; fertilizer production and soil conservation; and TVA's land acquisition and disposal programs. Each chapter is replete with figures which alternately inform and confuse the reader. The well-known, but rarely understood, problems of cost allocation, power rates, and cooperative electrical distributing system are encountered and defeated.

Throughout his book, it is apparent that Mr. Howard has something he wants to say. In the last chapter it emerges as a plea against the extension of the authority-idea to other sections of the United States. Whatever may be their respective feelings on this point, many forester readers will find it difficult to accept the author's glib assurance of the competency of the U. S. Army Engineers in designing and establishing flood control improvements. Also, the author's concept of regional development of water resources as being exemplified by the miscegenated Pick-Sloan plan may be more of a tribute to his naivete than a compliment to his readers' knowledge of the Missouri problem. All in all, this book does not comprise a worthwhile appraisal of the TVA.

PAUL R. KRAMER.

❦❦❦

Conservation In The United States. By F. A. Gustafson, C. H. Guise, W. J. Hamilton, Jr., and H. Ries. 3rd ed. 534 pp. Illus. Comstock Publishing Co., Ithaca, N. Y. 1949. $5.

The third edition of *Conservation in the United States* is a more comprehensive work than the edition of 1944 (reviewed in the JOURNAL for January 1945). The book has been enlarged to include important conservation developments of recent years, new legislation, and statistical information. Some of the topical information has been reorganized and better arranged. About 25 of the illustrations are new, and nearly 40 publications have been added to the list of selections for reference reading.

It is the opinion of the present reviewers that the teaching value of the book has been increased by the omission of questions at the end of each chapter, which was a feature of the previous edition. Any teacher using the book as a text should be capable of adding his own enrichment

to the course through his questions.

The new edition follows the trend in conservation education in that it pays increased attention to the needs of preserving natural resources for human prosperity. It is pointed out that "Future generations have a right to expect that their forebearers will pass on to them a country amply supplied with the materials essential to life and security." The authors emphatically encourage education of the landowner and the general public in the control of soil erosion, conservation of water, forest, wildlife, grass-lands, and mineral resources. A strong plea is made for an effective, forward looking public program of preserving and increasing our national heritage.

The essential facts of water conservation are adequately treated. It might be questioned whether the control of sedimentation affecting the life of reservoirs should not be given special emphasis in the chapter on water conservation as well as under soil conservation. The control of pollution as it affects human health is mentioned, but could stand more forceful presentation since many states are unable to institute pollution control measures except as it stems from a serious public health menace.

The chapters on soils and soil conservation are essentially the same as those of the previous edition, but there is some interesting new material. The flood control section contains a history of flood occurrence in the Upper Mississippi Valley from 1785 to the present. Six pages are devoted to the reclamation and development of strip-mined areas, a subject which was limited to three paragraphs in the preceding edition. And an interesting new section presents the idea of stock-piling valuable surface soil removed in construction work.

The chapters on forest and forest conservation have been retitled and rewritten. Tables are in larger type, with wider spacing than those in the preceding edition, a distinct improvement. Much of the supporting data used in these chapters come from the Forest Service appraisals of 1945 and 1946.

The new chapters are entitled, "Forest and Forest Lands," "The Development and Status of Forest Conservation," and "Forest Conservation: A Program for the Future." All are well handled. It was encouraging to note that such a controversial subject as forest regulation was presented without bias, giving both sides of the argument.

With so much recognition now being given to the management of woodland in small ownerships, which make up a large percentage of the farm woodland in the country, it would seem that protection against grazing should receive more emphasis. Grazing is the major obstacle to forest conservation in many agricultural areas. At the same time, it should be pointed out that some of the most badly deteriorated farm woods may be in the process of conversion to their proper use, the production of agricultural crops.

The brief mention of tree planting machines on page 284 may cause the reader to under-estimate the importance of this development, which is revolutionizing the tree planting programs in many areas. Mention might also have been made of the advances being made in the mechanization of tree nurseries, including such things as the adaptation of the celery planter to the transplanting of seedlings.

Do the authors mean what they say on page 264, that there has been a decline in the per capita consumption of wood (as a whole)? Or has the decline been largely in the use of lumber? Other questions might be raised. Other comments might be made. But this third edition of *Conservation in the United States* is such a good book, above all so well written, that the present reviewers are inclined much more to praise than to criticism.

T. E. SHAW,
HOWARD MICHAUD,
Purdue University.

United States International Timber Trade in the Pacific Area. By Ivan M. Elchibegoff. 302 pp. Stanford University Press, Stanford, Calif. 1949. $7.50.

At a time when export markets are becoming more important in lumber trade, due to a slackening of domestic demand, this book should be of particular interest to students, lumbermen, and businessmen concerned with overseas timber trade. Apparently, the author is well informed about the economics of foreign trade and has applied his knowledge to commerce in timber. Past and present developments in international commerce timber in the Pacific area are presented in considerable detail, and with this information as a base an analysis is made of the past and probable future trends. As any fore-

casts for the future are debatable and uncertain, the indicated trends and suggestions for improving foreign trade set forth in the book are open to question. The vast fund of data presented, however, provides ample background for a thorough consideration of the problems involved.

In addition to the numerous tables, charts, and maps for the 27 countries comprising the Pacific area, an economic analysis is made of the pertinent points concerned in developing and maintaining timber resources and trade. Throughout the three parts into which the chapters have been grouped, special emphasis in each case is placed on the part the United States has taken in international timber trade in the Pacific area.

Part I provides general introductory information mostly of a statistical nature concerning the technicalities involved and the competitive resources available in the world and in the Pacific timber trade. The tables give data on international trade in timber and timber products for six different trade zones, data on world trade in timber for recent years, and values of world exports for timber and other important commodities. Other tables and charts show percentages of softwoods and hardwoods entering into trade in the Pacific area, and exports and imports by countries in the Far East trade zone. The terminology of trade terms and the general classes of woods in demand by different consuming areas are discussed along with the general aspects of supply and demand by countries within the Pacific area.

Part II concerns the interdependence of the economic geography of land utilization, forest resources, and population (as demand and labor factors) with respect to timber trade. Tables and text supply statistical information on the forest land and other land classifications for each of the countries. Comparisons are made of populations and land areas in relation to timber trade, land-use planning, and timber production. Development of the lumber industry by countries and by geographical areas within countries is described. Included in the chapter on the United States is a statistical history of the West Coast lumber industry starting from 1850 and extending to 1945; it gives the number of establishments, capital invested, value of products, wages, exports, and other pertinent data. Lumber production in the United States and on the Pacific Coast from 1869 makes an interesting comparison. A discussion of the war and postwar periods for each country brings the trade situation up to the present. Because of the limited printed material generally available, the chapters on China, Manchuria, and the Soviet Far Eastern territories are of particular interest.

Part III takes up the economic and political issues involved, formulates certain principles, and gives a summary of the conclusions reached. Two chapters are devoted to United States lumber production costs and lumber prices and the effect of lumber prices on trade. Other chapters handle the United States tariff policy on lumber, and the transportation problems within the United States, and the development of ocean transportation in the Pacific area. Tables are included on shipping rates and extent of waterborne log and lumber exports to principal countries in recent years. Another chapter on pulp, paper, and chemical uses of wood within the United States covers the economic developments of those industries for a brief period prior to World War II as well as for the years during and after the war. The two final chapters are in effect a summary and outlook for the timber trade based on preceding discussions and data. Summary tables show by countries the forest resources, growth, drain, and availabilities for domestic consumption. Import and export availabilities are tabulated for the important countries by year for the period 1948 to 1952.

The appendix is of interest in that it includes data on United States lumber production, exports, imports, and consumption for different years starting from 1799. Several other tables on United States timber trade and Canadian export trade in recent years are also part of the appendix. The extensive bibliography listing twelve pages of references and the general index are indicative of the thoroughness with which this book was compiled.

W. B. Greeley, vice president of the West Coast Lumbermens' Association, wrote the foreword for the book.

J. E. MYERS,
U. S. Department of Commerce.

The Native Forests of Cuyahoga County, Ohio. By Arthur B. Williams. 90 pp. Illus. Bul. 1, The Holden Arboretum, Cleveland Museum of Natural History. 1949. $1.

Dr. Williams has performed a difficult task in reconstructing theoretically the original forests in this county in which the city of Cleveland now occupies about one-sixth of the total area. He has tapped all possible sources of information and has, himself, visited every nook and cranny of the county in the course of 18 years as naturalist and ecologist for the Metropolitan Park Board and curator of education of the Cleveland Museum of Natural History. The result is an excellent historical and ecological treatise that is well presented and contains much of interest for ecologists and foresters.

The location, topography, soils, drainage, and climate are treated concisely, supplemented by diagrams and sketch maps that make clear the text. This is the foundation of his theoretical reconstruction of the forests of Moses Cleveland's day. The framework is provided by studies of "forest remnants" the old-timers found in present forest stands or as isolated trees over 150 years of age in the city. The descriptions of the present forest in different localities of the county are illuminated by many historical notes and testimony of long-time residents. This makes good reading, scientifically accurate in interpretation and not at all dull. To be sure, one not acquainted with the county is a bit confused by many local names of roads, streams, and park reservations, but not so the many citizens of the Cleveland area who frequent the forest parks in great numbers during the warm seasons. The descriptions are supplemented by photographic reproductions that are particularly clear in detail and deserve more than a passing glance.

Foresters cannot but be interested in the author's theoretical concept of the original forest types since it gives an excellent basis for treatment of present woodland and its rehabilitation within a region far more extensive that the confines of Cuyahoga County. The breadth of the author's objective is greater, however, and is well stated by him as follows:

"The value of such studies lies in the fact that they contribute to our understanding of the environment in which the civilization of the present day had its origins, and in which, though now greatly modified, we, in these latter days, live. Anything that helps mankind to a better adjustment to his environment is a contribution to human welfare and happiness. Such studies, taken together, add to our knowledge of the forces that determine the character and distribution of plants throughout the land."

The cream of the publication is to be found under the "Summary" and under "General Ecological Relationships." A particular matter of interest is Dr. Williams' statement that Cuyahoga County is on a tension line between eastern and western and northern and southern plant associations of the great deciduous forest formation of northeastern North America. This he points out is true both of the flora and fauna.

Finally, one notes with pleasure the check list of native and introduced trees. Both the local and scientific names are given and a paragraph is each case on the site where found. The last two pages contain a well chosen list of 39 publications cited in the text.

S. N. SPRING.

The Charles Lathrop Pack Demonstration Forest, Warrensburg, N. Y. By Clifford H. Foster and Burt P. Kirkland. 35 pp. Illus. The Charles Lathrop Pack Forestry Foundation, Washington, D. C. 1949.

The Pack Forest of the New York State College of Forestry at Warrensburg, N. Y. was given two good breaks early in life: it was brought forth on the eve of the Great Depression; and it lay outside the orbit of the 1948 hurricane. As a result of the first situation, only half the scheduled annual cut was made for the first ten years, thus compensating for a 50 percent plus-error in the original cruise. The additional fact, that the big blow-down stayed on the east side of the Champlain Valley, has left the forest with probably the best stand of white pine on any comparable area in the Northeast.

This 2,200-acre demonstration area, in which Charles Lathrop Pack lies buried, is for both practical and show purposes a white pine forest. One-fourth of its merchantable portion, in area, and more than half its sawtimber volume, is made up of white pine, and all the principal developments in management, processing, and marketing have been built around this species. Twenty years of managing white pine have made Clifford Foster one of the outstanding exponents of blister rust control.

The central objective of management, which is in a fair way to be realized, has been the building up of quality growing stock, with emphasis on increase in value rather than on volume increment alone. This requires an intensive type of silviculture based on light cuttings at frequent intervals, persistent liquidation of defective and other low-quality trees, and an annual cut of considerably less than the increment. Under such a policy it has been possible to bring about an average annual increase (based on pre-inflation stumpage prices) of $4,000 in capital value during 17 years of commercial operations. In volume, the forest started with 7 million feet of sawtimber in 1930, has had 3 million cut, and shows a stand of more than 10 million now.

This accomplishment is the result not only of silviculture, but in equal measure of the introduction of three features traditionally lacking in the Adirondack lumber industry: precision manufacture, lumber grading, and development of a varied market for small material. This integration of marketing with management has been carried to its ultimate conclusion through studies of grade recovery from individual trees, on the basis of which trees are now "graded" in the woods.

As with most subsidized forests, it has proven difficult to unscramble the various items of cost and income so as to present a balance sheet comparable to that of a private concern. The total capital investment in the forest is known to be over $300,000. This includes the original cash investments in land and timber amounting to $100.000, plus later investments in the sawmill and other buildings, $78,000; equipment $25,000; estimated costs of permanent improvements by CCC and student labor, $35,000; and increase in timber values $79,000. Operating expenses on the commercial forest area, minus any charge for interest and taxes, are given as $109,000. Income from sales plus current lumber inventory comes to $175,000 leaving a "profit" of some $66,000 for the entire period. However, when an additional $160,000 of college appropriations covering the director's salary, technical assistance, and general overhead is thrown into the picture, it puts the forest (on paper at least) $15,000 in the red. The question, as always, is how much to write off for education, experiment, and public relations. In this connection, it is to be regretted that more specific reference is not made to the several research projects, in both silviculture and forest pathology, that have been carried on at the forest over a period of years.

There is much interesting detail in the bulletin regarding silvicultural practices in both hardwood and softwood types, with commentaries on special features such as the "Ecological Reserve Area," public service, the use of the forest for adult as well as student instruction, and the geological and historical background of the area.

It is when the authors turn from objective analysis to polemics, that the discourse emits a few sour notes. It was a temptation, no doubt, for Messrs. Foster and Kirkland to take this opportunity to air their views on the State Forest Preserve, but it was a temptation that should have been resisted. The Forest Preserve policy in New York is a political, not a technical problem, as the authors well know, and discussion of it belongs in the political arena, not in a technical bulletin. Furthermore, some of the comments on this point are downright misleading. For instance, in the section on "Recreation" it states that Pack Forest is "much more intensively used by the public than the roadless state-owned forest lands nearby." No examples less typical of the Forest Preserve as a whole could have been cited than the few detached parcels of state land within ten or fifteen miles of Warrensburg, and from such a statement the uninitiated would have difficulty in visualizing the 573 miles of foot-trail, the 162 leantos, the 104 miles of ski-trail, and the 30 public campsites which accomodate three-quarters of a million people annually—all these on the "roadless" and allegedly little used Forest Preserve!

However, these minor omissions and digressions do not detract materially from a publication which is extraordinarly interesting, timely, and provocative of serious thinking. No forester engaged in public or private forest management should fail to give it a repeat reading. The format is up to the usual Pack Foundation standards, and the work is prefaced by an eloquent tribute to Mr. Pack, from the pen of Dean Illick.

E. W. LITTLEFIELD,
New York Conservation Department.

Hardwood Lumber Inspection. By Arthur W. Price and Raymond J. Hoyle. Tech. Pub. No. 70, N. Y. State College of Forestry, Syracuse. 44 pp. 1948. 20 cents.

Taking the official rules book of the National Hardwood Lumber Association as a text, Price and Hoyle have undertaken "to make the many important details of hardwood lumber grading more easily understood." With this objective, the authors have taken the technical terms, which perforce must be used in defining lumber grades, as with any technical subject, and through the use of examples and diagrams have brought their meaning to the level of a layman. A forester or anyone else who has a speaking acquaintance with hardwood grade classification as First and Seconds, Number One Common et cetera, but who desires to know how to analyze the factors that differentiate grades, will find this bulletin a valuable aid.

In the introduction, the essential difference between grading hardwood and softwood lumber is pointed out. "Hardwood grades are based primarily on the amount of 'cutting' value in a board for industrial uses while softwood grades depend primarily on the size of defects and the factors detrimental to the strength qualities of the entire piece." The authors then explain the unit method for determining grades, how surface measure is computed and used in figuring the required units of clear or sound face cuttings. Considerable space is given to explaining standard grades and in analyzing the specifications for these grades. A summary of these specifications has been put in a table so that a quick determination can be made of the minimum sized boards and the size of cuttings allowed for each grade; also the maximum number of cuttings permitted for boards of a given surface measure. This is followed with a number of diagrams of boards showing how "cuttings" are located and measured. The grade of the board is then determined based on a calculation of the units contained in each cutting. A few errors were noted in the calculations given, which should be corrected in another printing.

One of the important inclusions in this publication is the description of "some typical uses for the grades," for this gives meaning to the principles of hardwood grading. The authors, drawing on their experience, cite definite examples of good and bad use of grades for various end products. These should be of interest to manufacturers of wood products who desire to learn the most economical grade to use for a given product.

A few omissions were noted in the footnotes of the condensed table of standard grades from those in the official rules book. All in all, the bulletin is an excellent treatment of a difficult subject and a much needed one in the field of wood utilization.

ROY C. BRUNDAGE,
Purdue University.

Extent, Character And Forestation Possibilities Of Land Stripped For Coal In Central States. By G. A. Limstrom. 80 pp. Illus. Tech. Paper 109. Central States Forest Expt. Sta. Columbus, Ohio.

This paper presents the initial results of an intensive study starting in 1946. Many of these results are not final, but are the best information obtainable from the work that has been done to date. In addition to giving the first accurate figures on the area that must be dealt with in the revegetation of mined lands, the report makes the first attempt at a general over-all classification of the sites that must be considered. It includes general planting recommendations and a tentative planting guide based on the classes of material in the banks. It also outlines the additional research needed to assist in the solution of the problem.

The site conditions which must be dealt with are complex. The wide ranges of pH, from below 3.8 to above 8.0, often found within a few feet of each other; the extreme range of textures from extreme rockiness to sands, silt, shale, clay, glacial till and loess; the extremes of topography encountered; the unstable material of some banks and the presence or absence of vegetative cover—all contribute to the complexness of the planting problem.

The detailed classification of the mined areas by counties for each state in the region covered gives the first complete accurate record of the areas that have been mined and all the different types of materials that have to be dealt with in the revegetation of those areas.

The tabular classification and the map record of the areas now revegetated, and the type and density of the cover which they now support, give the only complete record of the work that has been done to date.

It is an extremely well done piece of work well presented.

L. E. SAWYER,
Indiana Coal Producers Association.

Use of Fertilizers in Forest Nurseries and Plantations (Hnojení lesních kultur). By Antonín Němec. 218 pp. Illus. Brázda, Praha, Czechoslovakia. 1948. Kčs. 72.

The writer, chairman of the State Institute for Forest Pedology and Biochemistry, has faced in his career the difficult task of reestablishing fertility in many so-called "sick" or depleted soils of nurseries and forest plantations. His recent book gives an account of foresters' experiences with the use of fertilizers throughout the world, and summarizes the results of his own work in this field, covering a period of over twenty years.

The introductory part deals with selection of nursery sites and principles of nursery soil management. This is followed by a discussion of nutrient requirements of seedlings, intake of nutrients during different periods of growth, and symptoms of malnutrition. Special sections are devoted to the role of micro-elements and mycorrhizal fungi. Soil-enriching materials are treated under three headings: (1) organic fertilizers (humus, peat, compost, briquets, liquid humates, and animal manures); (2) green manure crops; and (3) mineral fertilizers (ash and lime; nitrogen, phosphate, and potash fertilizers; combined fertilizers; crushed rocks, and industrial waste by-products). Particular attention is given to collection of soil samples, diagnosis of nutrient deficiencies in nursery soils, and maintenance of fertility on the basis of soil analysis. The last chapter is devoted to the use of fertilizers in forest plantations. Remarkable results achieved by Dr. Nemec with the combined use of commercial fertilizers and legume crops, and with application of crushed basalt, should be of interest to both foresters and horticulturists.

The writer's observations of damages produced by deer to seedlings raised with different kinds of fertilizer deserve the attention of nurserymen in many sections of this country. In his experiments, stock treated with physiologically acid fertilizers (ammonium sulfate) was particularly sought by animals, whereas stock raised with base-forming fertilizers (sodium nitrate, Thomas slag) was left untouched. The sample plots established by Dr. Nemec in Czechoslovakia for observation of the behavior of fertilizer-treated stock under field conditions should bring valuable information or more than local significance.

The literature comprising about 200 references is international in scope. It contains one of the most complete lists of references of American works in this field published to date.

S. A. WILDE,
University of Wisconsin.

Effect of Timber Cutting on Water Available for Stream Flow from a Lodgepole Pine Forest. By H. G. Wilm and E. G. Dunford. 44 pp. Illus. U. S. Dept. Agric. Tech. Bul. 968. 1948.

Logging of mature lodgepole pine in the central Rocky Mountains increases initial storage of snow up to 26 percent and swells the quantity of water available for stream flow by 31 percent. These are findings, generally applicable to the lodgepole stands in Wyoming and Colorado, of a hydrologic experiment conducted during the past decade on the Fraser Experimental Forest within the headwaters basin of the Colorado River, and reported in this publication.

The authors devote considerable space (the first 12 pages of their report) to discussions of water supply as the limiting factor in the economic development of the West; the sources of water; the components of water yield; possible ways of increasing the supply; a very interesting resume of past studies which have a bearing on the subject; and the reasons for selecting this particular area and type for the experiment. The other 28 pages of description, analysis, pertinent illustrations, and tables present a generous amount of detail regarding their project, enough in fact to establish very thoroughly the validity of the conclusions reached. The list of 56 references to literature cited makes a convenient bibliography of the important subject of the relationships of forest cover and water supply.

More than half the water originating in the

central Rocky Mountain region flows from the high mountains. A large part of this water-yielding zone is occupied by the lodgepole pine type, covering about 3 million acres. This forest, producing at least one acre-foot of water per acre, yields about 3 million acre-feet annually, worth about 8 million dollars for irrigation alone. Reservoirs, dams, canals, and tunnels add nothing to the total yield of water from the mountain watersheds. It is important that the forester, as watershed manager, learn and apply all possible methods of handling the forest cover so as to produce the greatest well-regulated flow of silt free, usable water.

The studies here described are intended to supply definite information on how timber cutting in a variety of intensities affects the amounts of water which are available for stream flow. On the Fraser Forest it has been found that about 90 percent of the water yield has been derived from melting snow between the first of April and the end of June. Annual precipitation averages about 24.5 inches, very little of which falls as summer rains. Particularly important in the studies, therefore, were such factors as snow intereception, snow melt, snow evaporation, infiltration, and soil moisture deficits in autumn. The studies were begun in the spring of 1938 on 20 plots, each 5 acres in size and surrounded by a 3-acre isolation strip. After two years of record keeping on snow storage, melting rates, and net summer precipitation, 16 of the plots were "treated" by harvesting varying amounts of timber while four plots were left uncut. During the succeeding four years careful observations were made and data secured on all the important water-cycle components and also on the effects of the timber cutting on the forest and soil. It was found that "timber cutting exerted profound effects on all measured components except soil moisture, and these effects increased consistently with the intensity of timber removal." The heavier the cut the more snow was stored and the greater was the net precipitation for both spring and summer periods. As might be expected the snow melted more quickly on the cutover plots, but because of the larger amount of snow on these plots the snow disappeared from all plots at about the same time. Combining net snow storage and rainfall with snow evaporation and soil-moisture deficit data showed 10.34 inches of water available for stream flow on the uncut plots, or about 42 percent of the total annual precipitation, as against a yield of 13.52 inches on the heavily cut plots.

No visible erosion was reported on any of the plots except a little gullying on some of the steeper logging roads. There has been little invasion by grasses, weeds, or woody plants but new seedlings of both lodgepole and other conifers and some few aspen sprouts have appeared. How long after cutting the reported increase in water yield will be maintained is of course a question not answered by this study. It is the authors' opinion that "unless cutover areas are invaded by quick-growing aspen, there should be only a relatively slow return to normal canopy densities and interception rates." However, it may be well not to go overboard and let our enthusiasm for more water lead to extremes of over cutting.

ALLEN S. PECK.

Proceedings of the Auburn Conference on Statistics Applied to Research in the Social Sciences, Plant Sciences and Animal Sciences. 91 pp. Illus. Statistical Laboratory, Alabama Polytechnic Institute, Auburn. 1948.

This report of the proceedings of the Auburn conference indicates what a significant step was taken in bringing together so many distinguished scientists working in a particular region of the United States on problems basically dependent for solution on the application of statistical analysis. Quoting in part from Prof. Snedecor's foreword: "It is a hopeful sign for experimentation in the South that interest in statistics has brought together a group of statisticians and experimenters to discuss their mutual problems. The exchange of ideas and reports of research can but improve the quality of their work." The meeting was sponsored jointly by the University of North Carolina, Iowa State College, Virginia Polytechnic Institute, the Southeastern Agricultural Experiment Stations, and the U. S. Department of Argiculture.

The conference covered a period of three days, during which time eight lectures and 23 abstracts were presented, together with three papers on the organization and promotion of statistical activities. The lectures and abstracts were well proportioned between three subjects, social sciences, plant sciences, and animal

sciences. It is particularly revealing to those not familiar with research problems in other fields to learn of some of the methods used, and some of the problems encountered. The eight lectures are well reproduced, some of them with illustrations. It is to be regretted that the text does not present the discussions of these papers. The abstracts, while too brief to add materially to the statistical structure of the conference, do emphasize the trends in experimental designs.

Prof. Gertrude Cox presented an excellent paper, "A Proposed Statistical Plan for the Southeastern States." The detailed information is such that it can be used to good advantage by any organization or group of organizations contemplating a statistical "clinic."

There is comparatively little information on forestry problems, the total consisting of two abstracts, one by L. R. Grosenbaugh of the Southern Forest Experiment Station, and the other by T. C. Evans of the Southeastern Forest Experiment Station.

JOHN C. SAMMI,
New York State College of Forestry.

A Concise Encyclopedia of World Timbers. By F. H. Titmuss. 156 pp. Philosophical Library, New York. 1949. $4.75.

Macroscopic descriptions of nearly two hundred commercially important timber trees are given in nontechnical terms. The trees are listed alphabetically by their trade names. British, rather than American, terminology is used. In general the descriptions appear to be written for the woodworker or timber merchant rather than for the technologist.

As a handy reference work, the book has certain advantages not possessed by more exhaustive tomes. However, it is not without occasional errors. For example, the American chestnut tree is said to be "diminishing rapidly owing to the depredations of the 'Sweet Chestnut Borer.'" Without wishing to be unduly critical, the reviewer believes that a book which is offered for sale as being encyclopedic should not confuse a "borer," which is an insect, with the chestnut bark disease or blight, a fungus.

The price is much too high.

Current Literature

Compiled by MARTHA MEELIG, *Librarian*
The New York State College of Forestry

Range Management Section Compiled by
FRANCES FLICK, *Library, U. S. Department of Agriculture*

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Silviculture

Oak Sites in the Arkansas Ozarks. By J. L. Arend and Odell Julander. 36 pp. Illus. Arkansas Agric. Expt. Sta., Fayetteville. 1948. Bul. No. 484.

Reduction of Error in Line-Plot Tally. By C. C. Thomson. 2 pp. Canada Dominion Forest Serv., Ottawa. 1949. Silv. Leaflet No. 28.

Review of Published Information on the Larch-Douglasfir Type. By R. K. LeBarron. 14 pp. Northern Rocky Mt. Forest and Range Expt. Sta., Missoula. 1948. Station Paper No. 15.

Wildlife

Professional Opportunities in the Wildlife Field. By D. B. Turner. 208 pp. American Nature Association and The Wildlife Management Institute, Washington, D. C. 1948. $1.

Wood Preservation

Service Life of Treated and Untreated Fence Posts; 1947 Progress Report on the T. J. Starker Post Farm (Project No. 29) 20 pp. Oregon Forest Products Laboratory, Corvallis. 1948. Progress Rept. No. 1.

Service Tests on Posts as a Means of Evaluating Wood Preservatives and Methods of Treatment. By J. O. Blew, Jr. 10 pp. Illus. U. S. Forest Products Laboratory, Madison, Wis. 1948. Rept. No. 1726. Mimeog.

Wood Technology

Lexique Illustré; Des Termes Utilisés dans la Description des Bois. By D. Normand. 23 pp. Illus. Ministère de la France d'Outre-Mer. 1946.

Timber Beams Reinforced with Spiral-Drive Dowels. By G. P. Boomsliter. 45 pp. Illus. Engin. Ext. Sta., West Virginia Univ., Morgantown. 1948. Research Bul. No. 23.

Society Affairs

Officers and Members of the Council—1948-1949

CLYDE S. MARTIN, *President*
Weyerhaeuser Timber Company,
P. O. Box 1645,
Tacoma 1, Wash.

CHARLES F. EVANS, *Vice-President*
U. S. Forest Service,
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HENRY CLEPPER, *Executive Secretary*
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WILLIS M. BAKER,
Forestry Relations Division,
Tennessee Valley Authority,
Norris, Tenn.

CHARLES H. FLORY,
State Commission of Forestry,
Calhoun State Office Building,
Columbia, S. C.

RICHARD E. MCARDLE,
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Corvallis, Oreg.

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DEWITT NELSON,
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Department of Natural Resources,
Sacramento 14, Calif.

JAMES C. EVENDEN,
Bureau of Entomology and Plant Quarantine,
U. S. Department of Agriculture,
Coeur d'Alene, Idaho.

CLARENCE S. HERR,
Woods Department,
Brown Company,
Berlin, N. H.

JOHN W. SPENCER,
U. S. Forest Service,
Post Office Building,
Denver 2, Colo.

Nominations Invited for President and Council in S.A.F. Election

All members are again reminded that the regular biennial election will be held next December 10. A president, vice president, and nine other members of the Council will be elected for the two-year term 1950-1951.

Any or all of the present Council may be renominated, provided they accept the nomination in writing. However, President Martin has announced that he will not be a candidate for reelection.

Membership on the Council is restricted by the Constitution to Members (formerly Senior Members) and Fellows. Any Member or Fellow is eligible to hold office who is in good standing and who accepts the nomination in writing and declares his willingness to serve if elected.

Each voter will have an opportunity to ballot on all candidates for office. Candidates for the office of president are voted on separately; the candidate who receives the highest vote is declared elected president, and the candidate who receives the next highest vote is declared elected vice president.

The nine remaining Council members are elected in accordance with the system of proportional representation. The procedure of proportional representation will be explained in a later issue of the JOURNAL. It is the system by which the Society has been electing Council members for the past decade.

How Nominations Are Made

The Constitution (Article VIII, Section 2) states the conditions under which nominations are made by petition.

1. Each petition shall name but one candidate.
2. All candidates must be eligible to hold elective office.
3. A petition shall bear the signatures of at least ten voting members who at the time of signing the petition are eligible to vote in the coming election. (Eligible voting members are Junior Members, Members, and Fellows in good standing.)
4. A voting member may not sign more than one nominating petition for member of the Council.
5. Petitions must be submitted by October 15.

The Society has no special form for submitting nominating petitions. They may be written as follows:

We, the undersigned voting members of the Society of American Foresters, hereby nominate John Doe, a

Member (or Fellow), for the office of president (or member of the Council) for the two-year term 1950-1951.

All nominating petitions should be sent promptly to the Society's executive office. The names of all candidates will be announced monthly in the JOURNAL as petitions are received.

There must be at least two candidates for the office of president, and at least nine candidates for membership on the Council.

Nominations Received

Up to the time of going to press with this issue, the following nominations had been received.

For President

Charles F. Evans, U. S. Forest Service, Atlanta, Ga. (Southeastern Section.)

For the Council

Lloyd P. Blackwell, Louisiana Polytechnic Institute, Ruston, La. (Gulf States Section.)

Frank H. Kaufert, Division of Forestry, University of Minnesota, St. Paul, Minn. (Upper Mississippi Valley Section.)

E. W. Littlefield, Division of Lands and Forests, New York Conservation Department, Albany, N. Y. (New York Section.)

Gordon D. Marckworth, College of Foresty, University of Washington, Seattle, Wash. (Puget Sound Section.)

Stuart Moir, Western Forestry and Conservation Association, Portland, Ore. (Columbia River Section.)

Earl Porter, International Paper Company, Mobile, Ala. (Southeastern Section.)

The Coming Election of Fellows. How Fellow Nominations Are Made

All Members (formerly Senior Members) and Fellows of the Society are hereby advised that nominations for the grade of Fellow are now open. The election of Fellows will be held at the time of the Society's regular biennial election next December 10.

As defined by the Constitution (Article III, Section 6), "Fellows shall be foresters of outstanding achievement as leaders in responsible directive or distinctive individual work of a fruitful character. They shall be elected from the Members and shall be engaged in forestry work at the time of their election."

Significance of the Grade

The highest distinction that can be conferred on a member by the Society, this grade is awarded in recognition of outstanding achievement. Fellows do not pay increased dues; their dues are the same as those of Members.

Since the Society was founded in 1900, there have been 66 Fellows elected, At the present time the number of living Fellows is 50. Since the last election in December 1947, four Fellows have died: William G. Howard of New York; Aldo Leopold of Wisconsin; G. A. Pearson of Arizona; and Hugo Winkenwerder of Washington.

Nominations Are Made by Petition

The procedure for placing Members in nomination for the grade of Fellow is by petition. The Society has no printed form for this purpose. The petition may be typewritten thus:

We, the undersigned Members and Fellows of the Society of American Foresters, hereby nominate——— to the grade of Fellow for the regular election of 1949.

Remember these simple rules:

1. A petition may not name more than one candidate.
2. It must be signed by 25 Members or Fellows in good standing.
3. It should be accompanied by a factual, not eulogistic, biographical sketch of at least 200 words giving an account of his professional career and accomplishments.
4. It must be received in the executive office of the Society in Washington, D. C., not later than October 15.

The executive employees of the Society cannot be responsible for obtaining signatures on partially completed petitions or on petitions incomplete by reason of unacceptable signatures (that is, signatures of other than Members and Fellows in good standing).

Election Procedure

Fellows are not elected by the membership at large, but by a board of electors which consist of all present Fellows and the present Council. (A Council member who is also a Fellow has but one vote.)

A form of preferential voting is prescribed by the Constitution and Bylaws by which the electors indicate first, second, and third choices. The system is described in Bylaw 21. To win election a candidate must receive an affirmative vote of not less than one-half the total eligible votes cast.

List of Fellows

The current roster of Fellows follows. The state in which each Fellow is domiciled and the year of his election are shown after his name.

Allen, Shirley W. Michigan. 1948.
Baker, Hugh P. Massachusetts. 1948.
Bates, Carlos G. Minnesota. 1940.
Besley, Fred W. Maryland. 1940.
Butler, Ovid. Maryland. 1940.
Carter, E. E. District of Columbia. 1942.
Chapman, H. H. Connecticut. 1922.
Cheyney, E. G. Florida. 1944.
Clapp, Earl H. Maryland. 1930.
Coffman, John D. District of Columbia. 1946.
Dana, Samuel T. Michigan. 1935.
Eldredge, I. F. Louisiana. 1942.
Fischer, Arthur F. California. 1940.
Frothingham, Earl H. California. 1942.
Gifford, John C. Florida. 1942.
Gill, Tom. District of Columbia. 1948.
Girard, James W. Oregon. 1944.
Granger, C. M. District of Columbia. 1946.
Graves, Henry S. Connecticut. 1918.
Greeley, William B. Washington. 1918.
Guthrie, J. D. Virginia. 1942.
Hall, William L. Arkansas. 1940.
Hawes, Austin F. Connecticut. 1939.
Hawley, Ralph C. Connecticut. 1942.
Holmes, J. S. North Carolina. 1939.
Hosmer, Ralph S. New York. 1932.
Illick, J. S. New York. 1946.
Jeffers, D. S. Idaho. 1948.
Kinney, J. P. District of Columbia. 1942.
Koch, Elers. Montana. 1940.
Korstian, Clarence F. North Carolina. 1942.
Lowdermilk, Walter C. California. 1948.
MacDonald, G. B. Iowa. 1944.
Marsh, R. E. District of Columbia. 1948.
Martin, Clyde S. Washington. 1948.
Mason, D. T. Oregon. 1948.
Mulford, Walter. California. 1939.
Munger, T. T. Oregon. 1946.
Peavy, G. W. Oregon. 1939.
Peck, Allen S. Colorado. 1946.
Preston, John F. Maryland. 1948.
Schmitz, Henry. Minnesota. 1940.
Show, S. B. District of Columbia. 1948.
Siecke, E. O. Texas. 1946.
Sparhawk, W. N. New Hampshire. 1946.
Spring, Samuel N. New York. 1939.
Watts, Lyle F. District of Columbia. 1946.
Winslow, C. P. District of Columbia. 1942.
Wirt, George H. Pennsylvania. 1948.
Zon, Raphael. Minnesota. 1918.

Statement for Original Petitioners

Bylaw 54, third paragraph, states:

> Appeal against actions or positions taken by the Council shall not operate as an injunction against said action in matters of immediate importance as affecting public or other measures in which delay might cause the Society and profession to suffer damage, and in which the Council has reasonable grounds for believing that it represents the majority opinion of the members, or on which the Society has previously determined its position. The right of appeal by petition of a small group shall not thus operate to thwart the purposes of the Society as interpreted by the elected Council, but shall serve, in absence of voluntary submission of a referendum by the Council, to bring about a determination, after proper discussion and deliberation by the membership, of any action of the Council as defined in Article VII, Sec. 3.

In the case of the attempted transfer by Congress of 462,000 acres of national forest land to the O. and C. Administration, for the purpose of increasing the grant of 50, later 75 percent, of gross revenue from timber sales, to the Oregon counties involved, which attempt failed of unanimous consent in the House of Representatives after being shipped through the Senate by this method, negotiations were undertaken with the president of the Society at once to secure action by the present Council confirming the position of the previous Council which opposed the passage of this bill. When it appeared, after the Council meeting in June 1948, that no action would be taken before the December 1948 meeting, the petition requesting action was formulated and presented in October. The author of the petition, having been invited on October 14 to appear before the Council at its conference in Boston December 15-18 to express his views on this matter, agreed to a postponement of action on it until that time. At this meeting the Council voted to submit the petition to the members for referendum vote.

It was assumed by the petitioners that the matter was one on which the Society through the Council could act, as involving public policy of concern to the profession. The Council took this stand in voting for submission. Later, Attorney Julius Kahn advised that this was a proper measure for Society action.

Instead of consenting to the submission of this question, the petitioners from the Columbia River Section took issue on this point, claiming that the question was not one that the Society should concern itself with. Instead of present-

ing the required statement opposing the action urged by the first petition, this action was intended to enjoin not merely the Council but the petitioners or members. If these petitioners believed that the subject was one that should not be acted on, they could have settled the matter by voting *no* on the first petition. As it is, the entire question as to whether the Society shall express itself on matters of public policy, which a group of petitioners or the Council believes concerns professional and public interests, is injected into this ballot. The Council has ruled that the second petition shall be voted on, in the same ballot as the first. After the results of the second question are determined, the vote for or against action on the first petition will be counted.

Meanwhile, the result of these procedures has been to nullify the purpose of the clause quoted above from Bylaw 54, and to delay action by the Society for a period so extended that the initial purpose of the first petition may be defeated, and that of the second petition accomplished by default. For on January 3, 1949, Senate Bill 148, identical with the former offending legislation, was reintroduced. Meanwhile, questions have been raised as to the correctness of certain factual information in the required counter statement prepared to accompany the ballot by members of the Columbia River Section; and the Council will thus have to reconsider the matter at its June meeting, after the lapse of a year from the time the measure was defeated in the last Congress, and six months from the date of reintroduction of the bill.

The reason for the addition to Bylaw 54 was a petition for a referendum to prevent the Council in 1937 from publishing a report exposing certain political conditions in the Civilian Conservation Corps. The petition was defeated and the report published, but the delay caused by the petition was considered as against the interests of the profession and Society. The present case constitutes in effect an attempt to enjoin not merely the Council but the members from expressing themselves as to whether or not a certain proposed bill affecting national forests should be passed.

If this legislation passes before the membership is able to vote on the questions, it gives rise to an interesting situation and will emphasize the intent of Bylaw 54.

H. H. CHAPMAN.

S.A.F. Consulting Foresters' List: Its Significance and Value

The March issue of JOURNAL carried a listing of the consulting foresters in the country, as known to the Society. Upon going over the listing of the various individuals and firms, the writer wondered by what method this listing was made.

It is to be assumed that all of those listed are members of the Society, for it would be entirely unfair to list nonmembers. Also, by what set of standards is a forester to be considered a consultant by the Society. Certainly everyone, although a member, who sets himself up in the business of consulting forestry should not be immediately recognized by the Society as an individual capable of doing what he claims he can.

It would be well for the Society to set up some standards by which it could determine whether or not an individual or firm should have the recommendation given by official publication in the JOURNAL. Such a listing is a direct endorsement, which the Society should be able to back up by actual proof of the experience, background, education, and ethical conduct of the individual or members of the firms so listed.

At present there are two lists of consulting foresters, one compiled by the U. S. Forest Service, and the other by the Society. It appears that the Society should maintain strict regulations relative to its list, so as to assure any private individual desiring consultant work ready reference to a list of highly qualified foresters, who are also members of the Society. The Forest Service, in maintaining its list, would necessarily have to include nonmembers, as well as those who do nothing but cruise timber, for the sake of their public relations work. Let the Society roll of consulting foresters be truly that.

F. X. SCHMIDLEY,
Member.

Explanation by the executive secretary.

The list of consulting foresters as periodically published by the Society had the following foreword (see the March issue of the JOURNAL, page 240):

The following list of consulting foresters has been compiled by the Society of American Foresters for the information of prospective clients, especially private woodland owners and operators.

By the publication of this list the Society realizes its professional obligation to protect the interests of the

public, but it cannot assume responsibility for the actions of individuals or firms listed. The Society believes that the following individuals and firms are qualified and competent to perform the specialized technical services specified. Proved violation of a contract or agreement to perform specific service by any individual or firm will result in the removal of his name or agency from subsequent lists.

Previous lists have included nonmembers as well as members of the Society. Hereafter, the lists will be confined to members, but with the following exception: in the case of a consulting firm of which not all employees are members the firm will be listed provided one or more employees are members.

Now that the Society has adopted a code of ethics, of which members have been informed and to which they have voted to conform, the Society's list of consulting foresters has a special significance to the public as a protection against unprofessional conduct. For that reason the Society can no longer list consultants who are not members; for while they might scrupulously observe all the canons of ethics, the Society would be without authority to take appropriate action if they did not.

Listing by the Society is not to be construed as official and *a priori* endorsement of all a consulting forester's activities. If a member of the Society engages in consulting practice and so notifies the Society, his fields of specialization are checked against his scholastic training and professional record on file in the executive office. Provided no inconsistencies are evident, he will be entitled to listing. Pending the advent of state licensing or examination by the Society, this procedure is about as far as the Society can go at present.

Mr. Schmidley is wrong in one particular. There are not two lists of consulting foresters; the Society's is the only one. The one issued by the Forest Service is a "List of Private Consultants in Forest Operations," which is a quite different thing.

The executive secretary agrees with Mr. Schmidley that the Society's list of consulting foresters should be based on high standards, and that the appearance on the list of any individual or firm should imply recognition of his qualifications and ethical conduct.

Criticisms and suggestions such as Mr. Schmidley's will enable the Society to improve its service to this group of foresters and to the profession generally. More comment is invited.

HENRY CLEPPER.

Elections to Membership

Affiliate

Hamlin, Mark E., N. H.
Tomlin, John W., Calif.

Associate

Rochester, Donald M., Md.

Corresponding

Souza, Paulo F., Brazil

Junior

Ahlgren, Clifford E., Minn.
Akers, Joseph C., Calif.
Alley, George W., Ind.
Anderson, John F., Wash.
Andrews, John R., La.
Anthony, Samuel W., Pa.
Bade, Gordon H., Ariz.
Bear, Daniel H., Virginia
Bonnell, Richard L., Ind.
Clawson, Robert F., Wash.
Crum, Ivan W., Ore.
Davies, Henry G., Ore.
Duckett, Henry E., Jr., Vt.
Eaton, John F., Ind.
Elwert, Frederic P., Ark.
Enke, William C. A., Idaho
Friend, Edwin A., Jr., Va.
Furlow, Edward P., Ind.
Garbutt, Philip N., Calif.
Goldsberry, George K., Ind.
Hall, John E., Ind.
Hanson, John, Mich.
Harrison, David B., C. A.
Holmes, Oliver L., Calif.
Hoover, Edward B., Miss.
Johnson, James W., Fla.
Johnson, Norman E., Ariz.
Kincaid, Frank H., Ore.
Kinder, M. T., Ind.
Kischel, Robert E., Ore.
Knight, Fred B., Maine
Krauch, H. C., Jr., Ind.
Larson, Robert L., Calif.
Larson, William T., N. Y.
Leavengood, G. R., Ore.
Lee, Charles N., N. Y.
Lewis, H. G., Ariz.
Limpert, Clarence E., Mich.
Lind, Orville E., Pa.
Losee, Stanley T. B., Can.
Michel, John E., Ill.
Miller, Bruce J., Mont.
Mlynek, William, N. Y.
Mulhollen, Orange L., Pa.
Odom, Jack C., La.
Pearl, Robert W., Miss.
Perkins, Robert H., Ind.
Petersen, Stanley S., Idaho
Remele, Kermit E., N. Y.
Rice, Herbert P., Miss.
Rice, James P., Jr., Mass.
Rickert, Lorenz H., Minn.
Rodrique, Ernest A., Miss.
Round, Harry A., Ore.
Schroeder, Richard L., N. Y.
Scudder, Kenneth T., S. C.
Semmens, George N., N. J.
Shellstrom, Walter N., Jr., N. Y.
Sosbe, Edward H., Ind.
Spector, Albert H., La.
Stephens, Marion A., Jr., La.
Thomson, R. W. B., Canada
Underbakke, Maynard W., Miss.
Vance, Paul N., Ore.
Vincent, Robert M., Ore.
Watson, Roe D., Ore.
Welch, John C., Maine
Wiener, Leo, N. Y.
Williams, Ward C., Alaska
Winston, Frank A., Ind.
Woodling, Richard H., Ind.
Wright, Lewis E., Ind.
Youngs, George J., N. Y.

Member

Aamodt, Einar E., Mich.
Bell, Lester E., Mich.
Bond, Adna R., Md.
Carey, Dudley C., D. C.
Carothers, J. E., Tenn.
Galbraith, Marlin C., Idaho
Harding, Robert W., La.
Lott, Edgar J., Ind.
Lynch, Donald W., Wash.
Marlatt, Ralph D., Ore.
Meneely, J. F., Idaho
Overly, Fred J., Va.
Silker, T. H., Texas
Stamm, Edward P., Ore.
Stewart, Bruce F., Texas
Sydansk, Raymond, Tunisia
Walker, Alexander, N. Y.

Reinstated

Junior

Jones, Horace E., Mont.
McConkey, Thomas W., Maine
McCraw, William E., Ill.
Moore, John S., Miss.
Morton, Paul, Maine
Schilling, Erwin A., N. Mex.

Member

Gaylord, Harry P., Colo.

Announcement of Candidates for Membership

The following names of candidates for membership are referred to the membership for comment or protest. The list includes all nominations received since the publication of the June JOURNAL without question as to eligibility. Names, addresses, education, and endorsements are given. The names have not been passed upon by the Council. Important information regarding the qualifications on any candidate which will enable the Council to take final action with a knowledge of essential facts should be submitted before August 15, 1949. Statements on different men should be submitted on different sheets. Communications relating to candidates are considered as strictly confidential.

Allegheny

Junior Membership

Barick, F. B., Land Mgmt. Asst., Pa. Game Comm., Harrisburg, Pa.; N. Y. State, B.S.F., 1940; M.S., 1943. J. S. Illick, L. P. Plumley, W. Harlow.

Hall, C. R., Dist. Forester, W. Va. Cons. Comm., Clarksburg, W. Va.; W. Va. Univ., B.S.F., 1939. W. C. Percival, T. Holsoe, M. Brooks.

Orum, R. M., Farm Forester, Delaware Forestry Dept., Dover, Del.; Pa. State, B.S.F., 1949. W. S. Taber, V. A. Beede, H. N. Cope.

Palmer, D. B., Inspt. Methods Engr., Piasecki Helicopter Corp., Morton, Pa.; Pa. State B.S.P., 1947; Yale, M.S.F., 1948. G. A. Garratt, E. V. Zumwalt, H. J. Lutz.

Yancey, T. E., Service Forester, Va. Forest Service, Waverly, Va.; N. C. State, B.S.F., 1949. C. C. Steirly, S. G. Hobart, W. F. Custard.

Appalachian

Junior Membership

Havel, J. F., Dist. Forest Engr., Int. Paper Co., Georgetown, S. C.; Pa. State, B.S.F., 1940. Reinstatement.

Hortin, R., Student, Duke Univ., Durham, N. C.; Mich. State, B. S. F., 1948. R. B. Thomson, F. X. Schumacher, C. F. Korstian.

Korb, H. W., Jr., Dist. Forest Engr., Tbr. Div., Int. Paper Co., Georgetown, S. C.; Pa. State, B.S.F., 1942. D. Fortgang, L. E. Howard, F. C. Gragg.

Olson, D. F., Jr., Grad. Student, Duke, Durham, N. C.; Mich. State, B.S.F., 1948; Duke, M.F., 1949. R. B. Thomson, F. X. Schumacher, C. F. Korstian.

Shoub, J. L., Party Chief, Int. Paper Co., Georgetown, S. C.; N. C. State, B.S.F., 1943. F. C. Gragg, H. A. Thompson, Jr., J. E. McCaffrey.

Member Grade

Gill, C. E., Asso. Ext. Forester, Va. Ext. Service, Blacksburg, Va.; N. C. State, B.S.F., 1941; Harvard, M.F., 1942. Appalachian (Jr. member, 1944).

Central Rocky Mountain

Affiliate Membership

Burnham, R. M., Draftsman and Const. Foreman, Homestake Mining Co., Spearfish, S. Dak. Central Rocky Mountain.

Junior Membership

Albee, L. R., Dist. Cons., S.C.S., Rapid City, S. Dak.; Univ. of Idaho, B.S.F., 1935, Reinstatement.

Central States

Junior Membership

Bober, E. J., Forestry Aid, U.S.F.S., Ironton, Ohio; Univ. of Mich., B.S.F., 1949. J. Carow, S. W. Allen, L. J. Young.

Hernandez-Agosto, Miguel A., Student, Univ. of Mich., Lansing, Mich.; Univ. of P. R., B.S., (Ag), 1946; Mich. State, M.S.F., 1947. S. T. Dana, S. W. Allen, W. W. Chase.

Massie, G. E., Research Asst., Univ. of Ill., Urbana, Ill.; Univ. of Mich., B.S.F., 1949. R. W. Lorenz, J. J. Jokela, D. A. Kulp.

Pfeifer, R. E., Farm Forester, Mich. Dept. of Cons., Ann Arbor, Mich.; Iowa State, B.S.F., 1941. N. F. Smith, T. E. Daw, G. S. McIntire.

Member Grade

Meeker, H. E., Jr., Grad. Research Asst., Purdue Univ., Lafayette, Ind.; Purdue Univ., B.S.F., 1940. Central States (Jr. member, 1946).

Columbia River

Junior Membership

Henthorne, R. W., Fire Control Aide, U.S.F.S., Klamath Falls, Ore.; Oregon State, B.S.F., 1949. G. H. Barnes, R. A. Yoder, W. F. McCulloch.

Johannsen, W. B., Forestry Aid, Ochoco National Forest, Prineville, Ore.; Oregon State, B.S.F., 1949. H. R. Patterson, R. A. Yoder, W. F. McCulloch.

Morris, L. H., Oregon State Board of Forestry (on leave), Brookings, Ore. Columbia River (Affiliate Member, 1945).

Pearson, H. G., Asst. Dist. Warden, Western Lane Forest Prot. Assn., Veneta, Ore.; Univ. of Oregon State, B.S.F., 1948. H. R. Oglesby, P. N. Knorr, W. F. McCulloch.

Voris, C. R., Jr., Tech. Asst., Klamath Fire Prot. Assn., Klamath Falls, Ore.; Oregon State, B.S.F., 1949. W. A. Davies, G. H. Barnes, W. F. McCulloch.

Wardell, G. D., Asst. Dist. Warden, Klamath Forest Prot. Assn., Klamath Falls, Ore.; Oregon State, B.S.F., 1949. W. A. Davies, G. H. Barnes, W. F. McCulloch.

Gulf States

Junior Membership

Cross, J. K., Forestry Aid, U.S.F.S., Valdosta, Ga.; La. State, (1 yr.), Gulf States (Aff. member, 1947).

Dolhonde, P. E., Forester, Southern Adv. Bag and Paper Co., Hodge, La.; La. State, B.S.F., 1949. R. W. Hayes, B. A. Bateman, W. M. Palmer.

Ebert, J. B., Student, La. State, Baton Rouge, La.; La. State,, B. S. F., 1949. R. W. Hayes, R. F. West, C. O. Minor.

Goodwin, A. L., La. State, Baton Rouge, La.; La. State B.S.F., 1949. R. W. Hayes, B. A. Bateman, C. O. Minor.

Grigsby, H. C., Dist. Forester, Miss. Forest Service, Jackson, Miss.; La. State, B.S.F., 1947. R. W. Hayes, M. B. Applequist, W. M. Palmer.

Howard, Hector H., Supv., Johns-Manville Prods. Corp., Natchez, Miss.; Pa. State, B.S.F., 1937. Reinstatement.

Marlin, C. B., Asst. Prof. of Forestry, Miss. State College and Exp. Sta., State College, Miss.; Miss. State College, B.S., 1943; Duke, M.F., 1949.

Miles, D. J., Student, La. State, Baton Rouge, La.; La. State, B.S.F., 1949. R. W. Hayes, L. L. Glasgow, W. M. Palmer.

Sigler, C. C., Student, La. State, Baton Rouge, La.; La. State, B.S.F., 1949. R. W. Hayes, B. A. Bateman, W. M. Palmer.

Inland Empire

Associate Membership

Bodine, Leo V., Asst. Editor, Weyerhaeuser News, St. Paul, Minn. Inland Empire.

Junior Membership

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J. D. Diller, Vice-chairman, Bureau of Plant Industry, Soils and Agricultural Engineering, U. S. Department of Agriculture, Washington 25, D. C.
J. P. McWilliams, Secretary-Treasurer, 3630 39th Street, N. W., Washington, D. C.

Wisconsin-Upper Michigan

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R. W. Abbott, Secretary-Treasurer, Assistant Extension Forester, University of Wisconsin, Madison, Wis.

Forestry News

Compiled by ROBERT D. HOSTETTER, *Assistant Executive Secretary*

Pulpwood Industry Sponsors Forestry Training Camps

For the fourth consecutive year the pulpwood industry through the Southern Pulpwood Conservation Association is providing one-week camps where the care and wise use of forest trees will be taught to farm boys in eight southern states. Members of the Association guarantee the expense of these camps and are assisted in some instances by non-member pulpmills, and in one state by the naval stores and lumber industries.

The state forestry department in each state administers the camp and arranges for the staff to teach forestry subjects. Boys selected to attend these camps must earn that privilege by performing outstanding work during the school year on forestry projects either on their own woodlots or in their school activities. The extension service and vocational agriculture departments of each state usually make the selections.

The pulpwood industry believes that the training given the 750 boys attending the camps this summer and the far-reaching influence of the program is a wise investment in the prosperity of the region which depends so largely on its forest resource.

Camps operating this summer are: Camp Grist, Ala.; Petit Jean State Park, Ark.; Camp O' Leno., Fla.; Laura S. Walker State Park, Ga.; Camp Grant Walker, La.; Lake Waukaway, Miss.; Bladen Lake State Forest, N. C.; and Holiday Lake Camp, Va.

New Honorary Organized

An honorary organization, called Sigma Lambda Chi, has been formed at Michigan State College, East Lansing, for the recognition of students with outstanding scholarship, leadership, and interest in light construction and lumber merchandising. Eight students majoring in that field were recently elected to membership in the honorary group which is probably the first of its kind.

W. S. Swingler Succeeds Evans As Region Seven Forester

William S. Swingler will be transferred on July 31 to succeed Robie M. Evans as regional forester for the U. S. Forest Service at Philadelphia. That region includes the 14 New England and Atlantic States from Maine to Kentucky.

Mr. Evans is retiring after 39 years with the Forest Service, having worked in the Northwest and Northeast. He is a Yale graduate.

WILLIAM S. SWINGLER

A graduate of the Pennsylvania State Forest Academy, Mr. Swingler has served with the Pennsylvania Department of Forests and Waters and since 1936 with the Forest Service. For the last three years he has been an assistant regional forester at San Francisco. During brief periods he was assigned to the New England Timber Salvage Administration, Timber Production War Project, and to General Douglas MacArthur's headquarters organization in Japan.

Preservative Treatment Urged

Advisability of the use of treated wood in farm buildings and for mine timbers was emphasized at the recent meeting of the American Wood-Preservers' Association in St. Louis.

Lower annual cost and conservation of the timber supply were cited as advantages.

Forestry Frequencies Permanently Assigned

Permanent radio frequency assignments were made to private and governmental forestry agencies in May by the Federal Communications Commission. The current action of the Commission is the outgrowth of a series of hearings during the past five years, the most recent having been last October.

Exclusive frequencies for the Forest Products Radio Service, one of three classes in the Industrial Radio Services, for both base and mobile stations are 29.73, 29.77, 49.22 to 49.50 megacycles, inclusive. Nine frequencies to be shared with the petroleum industry are in the 152-162 megacycle band. Frequencies to be shared with other services include 1676 and 1700 kilocycles, four frequencies from 49.54 to 49.66 megacycles, and 80 frequencies in the 72.76 megacycle band for fixed stations under the usual conditions that no interference be caused to television channels 4 or 5.

State conservation agencies will now be authorized to use radio in a wide range of activities, from flood control to enforcement of fish and game laws, whereas formerly it could be used only in connection with forest fire fighting activities. Revised frequency allocations provide for four exclusive frequencies instead of 14 shared frequencies.

Elmer Surdam, manager of National Forest Industries Communications, advises that detailed information on changing classification and in securing permanent frequency assignment can be obtained from his office at 1002 Terminal Sales Building, Portland 5, Ore.

Copies of the new rules can be obtained from the Superintendent of Documents, Washington 25, D. C.

Fosdal Quits TVA to Farm

Arne Fosdal, a forester with the Tennessee Valley Authority for 13 years, resigned on June 1 to return to the Northwest where he is planning to operate a farm.

School and Industry Meeting Promotes Close Cooperation

Frederick S. Baker, recently appointed dean of the School of Forestry at the University of California, was honored at a dinner sponsored by the California Forest Protective Association in San Francisco on January 21. Colonel S. Orie Johnson, lumberman and forest owner, of Berkeley, who is chairman of the Association's advisory Committee for the School of Forestry, was host of the occasion. The guests included thirty-five leaders of the California lumber industry, representatives of the United States Forest Service and the State Division of Forestry, President Robert G. Sproul and Vice President C. B. Hutchison of the University; members of the faculty of the School, and representatives of the alumni and the student body.

Colonel Johnson, who recently took leadership in establishing a series of prizes for forestry students at the University to be presented by the Association, announced the purpose of the gathering as welcoming Dean Baker's appointment and fostering closer relationships between forestry education and forest industries. Greetings to the new Dean were extended by Swift Berry of the Michigan-California Lumber Company, Walter S. Johnson of the American Box Corporation, George McLeod of the Hammond Lumber Company and Kenneth Smith of the Pacific Lumber Company, and others. Responses were made by President Sproul, Vice President Hutchison and other representatives of the University. Following the dinner Dean Baker expressed his thanks and in a brief address outlined the plans of the School of Forestry to train young men for employment in the forest industries of the State and to undertake research in the directions necessary to achieve better utilization and development of new products.

Syracuse Publications Listed

Publications of New York State College of Forestry are listed in a recent catalog from that institution. Included are technical, semi-technical, and non-technical publications of the college and of the Roosevelt Wildlife Forest Experiment Station.

Foresters Aid Woodlot Owners

Foresters in the Maryland Department of State Forests and Parks marked over 20 million board feet of timber for 545 woodlot owners during 1948, according to Karl E. Pfeiifer, assistant director. Average value of timber marked was $16.51 per thousand board feet.

Munger Urges Better Forestry To Prevent Industry Decline

"Research and educational work should be extended to stimulate better forest practices and to make possible better utilization of the tree and log," according to a recent report made to the Portland, Ore., City Club by a committee headed by Thornton T. Munger. Other recommendations for keeping forest lands productive included increased reforestation, intensified fire protection, and firm and universal enforcement of state forest conservation laws.

In the Portland area, the committee thought it advisable to "step up somewhat the cut on public lands in order to help maintain the present level of regional industry, even though a later shrinkage of activity will be necessary." Corporate timberland owners should adjust their annual cuts to balance sustained productivity, the committee stated.

The committee's study revealed that Portland has ceased to be the "most active sawmilling city in the world" because other centers nearer available timber supplies have a competitive advantage, but its position as a lumber port is likely to remain good.

Mr. Munger is a Fellow of the Society of American Foresters.

Coordinate Conservation Work

The new position of "chief, conservation education" has been established in the California Department of Natural Resources.

Edward F. Dolder, who was appointed to the position, will work with the State Department of Education in an effort to get better conservation training throughout California elementary schools and will coordinate the conservation program conducted in the natural resources department, primarily the Divisions of Fish and Game, Beaches and Parks, and Forestry.

Latest Methods Demonstrated at New York Nursery Meeting

Forty-eight men representing the forestry agencies of ten neighboring states and the federal government were shown latest practices used at the New York State Nursery, Saratoga Springs, during a forest nursery conference held there on May 9 and 10.

E. J. Eliason, assistant superintendent of tree nurseries, acted as program chairman and demonstrated nursery operations, including extraction, storage, seeding, lifting, and other steps in producing tree seedlings.

The use of specially adapted equipment to improve nursery efficiency was emphasized. Seed bed shapers, seed drills, sand spreaders, fertilizer spreaders, transplanters, a tree picker made from a potato digger and bundle tying machines were demonstrated.

An evening meeting featured a round table discussion led by F. M. Crossitt, U.S.F.S., Atlanta and a discussion of the Forest Practice Act in New York by E. W. Littlefield, superintendent of forest investigations in the New York Conservation Department.

Smith Takes to Maine Woods

At the end of April Forester Ralph W. Smith resigned from the Division of Forestry of the National Park Service, Washington, D. C., after 21 years of public employment.

Mr. Smith will become a farmer-forester, having acquired a farm on the Kennebec River, RD 1, Skowhegan, Maine. Approximately a hundred acres of the farm will be allotted to a woodlot project. He anticipates pleasure in managing his forest and farm as well as in entertaining friends, especially at haying time. He says "Maine has a very nice climate at haying time."

Nelson Resigns from B.L.M.

A. Z. Nelson, formerly Acting Chief of the Division of Forestry, Bureau of Land Management, Department of Interior, resigned from that division on April 15. He will engage in forest consultant work with headquarters in New Ipswich, New Hampshire.

Forestry Legislation

Forest

Hearings were held on May 25 before a Senate Subcommittee on pending forestry legislation. Considered were Senate Bills 2, 282, 369, and 1458, S.J. Res. 24, and H.R. 2296.

S. 1820 (by Anderson of New Mexico) is a bill to provide for the establishment of forest practices for the conservation and proper use of privately owned forest lands. Referred to Committee on Agriculture and Forestry on May 10. Copies of the bill can be obtained from the Society's Washington office. The proposals of the bill encompass so much that their summarization is impractical.

Recreation

H.R. 892, to establish a Federal interagency committee on recreation, was reported from committee on May 16.

Water and Soil

Hearings began on May 27 on Columbia River development bills: S. 1595, 1631, 1632, and 1645.

Protection

S. 1659, providing for Congressional approval of an interstate forest fire protection compact, passed the Senate on May 23 and was referred to the House.

Reorganization

On May 16 the Senate passed a combination of S. 526 and H.R. 2361, the reorganization bills, having previously rejected amendments suggested by the House. The House disagreed on May 17 to the Senate's amendments. A joint committee of both houses of Congress was then appointed to consider the proposals further.

Development

S. 1912 (By O'Mahoney of Wyoming) provides for the classification of the public lands of Alaska. Referred to Committee on Interior and Insular Affairs on May 20.

Ochsner Goes to Region Nine

H. F. Ochsner has been appointed to succeed the late Basil Wales as assistant regional forester in charge of timber management in Region 9, U.S.F.S., Milwaukee. During the past 3½ years he was the assistant timber management division chief in Washington, D. C.

Jahn Named Research Director

Dr. Edwin C. Jahn, formerly professor of forest chemistry at New York State College of Forestry, has been named director of research at the college. Operating with a $225,000 budget he will first define the college's research objectives and then develop a program for reaching them, independently and in cooperation with other agencies.

EDWIN C. JAHN

An international authority on cellulose, Dr. Jahn has been on the college's staff since 1938 with the exception of wartime service as a technical advisor and analyst with the State and Commerce departments.

Pulpwood Inventories High

According to the Pulp, Paper, and Board Industry Report for April 1949, issued by the office of Domestic Commerce, pulpwood inventories are well above those prevailing a year ago. Favorable conditions of procurement together with levelling mill requirements have been cited as reasons for the situation.

Pulpwood prices have experienced a definite softening. In the South they are 7 to 14 percent lower than a year ago, and in the Lake States prices are approximately $1.50 per cord lower than a year ago.

A severe shortage of wood pulp in Japan, where 845,000 tons were made in 1941, offers promise as a market for North American forest products.

Bulldozer Operator Awarded Forest Fire Heroism Medal

James W. Simons was awarded the American Forest Fire Medal on May 17 for his heroism and devotion to duty while skillfully constructing a fire line with a bulldozer under dangerous conditions on the Topanga Canyon forest fire in California's Malibu Mountains last November.

Simons, an employee of the Department of Los Angeles County Forester, is credited with saving 265 homes, valuable watershed lands, and preventing almost inevitable loss of life.

President Harry S. Truman, Secretary of Agriculture Charles Brannan, Chief Forester Lyle F. Watts, and S. L. Frost, executive director of the American Forestry Association, participated in the congratulatory exercises.

The awards committee of the American Fire Foundation is composed of: R. E. McArdle, assistant chief, Forest Service, U.S.D.A., Chairman, representing the American Forestry Association; W. K. Beichler, state forester of North Carolina, representing Association of State Foresters; Tom Gill, representing Charles Lathrop Pack Forestry Foundation; Charles A. Gillett, representing American Forest Products Industries; John D. Guthrie, representing Society of American Foresters; J. D. B. Harrison, representing Canadian Society of Forest Engineers; Fred E. Hornaday, secretary of awards committee, American Forest Fire Foundation.

Jackson Mills Sold Outright

Jackson lumber harvesters, formerly released only on a lease-franchise basis, are now being sold outright, according to Clinton D. Jackson, president of the recently reorganized Jackson Lumber Harvester Company, Inc. Headquarters have been moved from Wisconsin to Brewton, Ala.

Manufacture of other devices for portable lumber harvesting including edgers, "grit gougers," a machine for high-speed production of box lumber, and "efficiency indicator" is also planned.

South Carolina Forest Area Increases; Timber Decreases

Forest Survey Release No. 28, "South Carolina's Forest Resources, 1947" reveals that the total forest area in that state increased 11.2 percent during the preceding 12 years. Most of the increase was in lowland hardwoods.

Decline in total volume was 5 percent, but a 29 percent reduction of pine saw timber in the southeastern part of the state was disclosed.

I. T. Haig, director of the Southeastern Forest Experiment Station, Asheville, N. C., which made the survey in cooperation with the South Carolina State Commission of Forestry and the Extension Forester at Clemson College, said that better fire protection, better harvesting methods, thinning overstocked stands, planting denuded areas, and better distribution of drain by species and locality should aid materially in closing the gap between growth and wood requirements of the forest industries.

The inventory system used was based on interpretation of aerial photographs supplemented by cruising of randomly selected ground plots. Field data were placed on punch cards for machine tabulation.

TCI Uses Wood to Make Steel

The forestry conservation program of the Tennessee Coal, Iron, and Railroad Company was spotlighted on a May broadcast of "The Theatre Guild on the Air," presented by United States Steel Corporation.

T.C.I. has 275,000 acres of timberland, the management of which is planned by David Hampe and five other foresters. A program of selective cutting which puts timber-growing on a crop basis is practiced.

At present, one-third of the company's timber requirements are met from its own land, but studies indicate that eventually the company will draw its entire supply from its own forest lands.

Timber is used "to produce steel" as mine props, crossties, power line poles, building, dunnage and crating, and "for hundreds of other jobs about the mines and plants which cannot be done as practically by any other material."

Game Reduction Authorized

Action taken on April 29 by the California Fish and Game Commission inaugurates the practice in that state of allowing hunters to take female deer and elk. A special elk season in Owens Valley provides for the issuance by lottery of permits authorizing the taking of 50 bulls and 50 cows. Also, a special deer season on Catalina Island provides for the removal of 1,500 deer of both sexes.

In both cases the animals exceed their habitat.

Connecticut Publishes New Red Pine Volume Tables

Volume tables for plantation-grown white and red pine are available from the Connecticut Agricultural Experiment Station at New Haven.

Recently revised to apply to trees planted several decades ago, the red pine tables are authored by A. R. Olson and H. W. Hicock of the Station's forestry department and H. A. McKusick of the Connecticut State Park and Forest Commission.

Red pine thinnings from 15- to 25-year-old plantations are valuable for pulp, fiber for roofing felt, posts of various kinds, and for other purposes.

Cornell Selects Research Man

Robert Morrow, Jr., has been engaged by Cornell University to conduct farm forestry research and manage college forest properties, according to Dr. G. A. Swanson, head of the Department of Conservation.

Mr. Morrow is completing his Doctor's degree this summer at the New York State College of Agriculture.

Alternate Clear-Strip System Advised in Lodgepole Type

Bert Lexen, in charge of forest management research at the Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo., states in Station Paper No. 1 that experiments have shown the alternate clear-strip cutting method to be suitable for the lodgepole pine type in Colorado and Wyoming.

Advantages of the system include the opportunity to get two cuts per rotation of 120 years instead of one when complete clear-cutting is practiced; protection of young stand in clear-strip from wind; reduction of after-cutting fire hazard; retardation of spruce-fir climax; regeneration of poor sites; and protection of residual stand after heavy thinning.

Modifications of the alternate clear-strip system to suit particular conditions are possible.

Three-strip or four-strip systems are ideals or goals to be striven for, says Mr. Lexen, but cannot be satisfactorily applied until transportation systems and markets for small products are better established.

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Swedish Forester Studies Labor-Management Relations

Ulf Danielson, manager of a forestry employers association at Filipstad in western Sweden, spent four weeks in the United States in May and June studying labor relations in the timber industry. Stating that forest workers had long been organized for collective bargaining in Sweden, he was interested in what methods of job classification and evaluation were used in this country. Most of his time was spent in the Pacific Northwest, but he also visited other sections of the country where he observed union-management relationships and methods of solving grievances.

Forestry Techniques Shown

Three timber plots of one-quarter acre each—one of which had been marked and cut, one which had been tagged to indicate the products that would be cut, and the third which served as a basis for discussions—were featured at a recent forest harvesting demonstration at Chester, S. C.

Cooperating in the activities attended by 350 persons were the Chester High School Vocational Agriculture Department; Fred Mack and Harry Adidesian of the S. C. Forestry Commission; Robert N. Hoskins, industrial forester for the Seaboard Air Line Railroad; and George Mosely, representative of the Forestry Equipment Company of Florida, who demonstrated chain and circular saws and a mechanical tree planter.

Operation Handbill Conducted

Ranger John C. Webb of Jackson County, Alabama, combined statesmanship with business acumen when he recently secured cooperation to aerially distribute 10,000 forest fire prevention handbills.

Local lumber mills paid the cost of having the handbills printed, and the Scottsboro Flying Club gladly cooperated in flying the fire prevention messages to all parts of the county.

Citing the $514,000 payroll going to wage-earners handling products from Jackson County's half-million timbered acres, the handbills stressed to curious readers, "You have a big stake in your woods. Do your share to protect them from fire."

Forestry Council Organized

Establishment of the North Carolina Forestry Council, an organization designed to coordinate forestry practices in the State, has been announced by Dr. R. J. Preston, Jr., director of the Division of Forestry at North Carolina State College and secretary of the new organization.

The council is headed by Dr. C. F. Korstian, dean of the School of Forestry at Duke University. William Maughan of Durham, an official of the Cary Lumber Company, is vice chairman.

The council's membership is made up of representatives of the North Carolina Forestry Association, the State College Extension Service, North Carolina State College's Division of Forestry, Duke University's School of Forestry, the U. S. Forest Service, the Southern Pine Association, the Appalachian Hardwood Manufacturers Association, the Southern Pulpwood Conservation, and the State Forest Service.

Objectives of the council are to promote better understanding and coordination of forestry policies, programs, and practices in North Carolina, and to provide a clearinghouse for matters pertaining to the development and welfare of the forests of North Carolina.

Forest Service Publishes Grazing Policies Pamphlet

A booklet containing 35 questions and answers designed to explain the principles guiding grazing administration on the national forests was issued in May by the U. S. Forest Service.

Aims of the Forest Service are: 1. The protection and conservative use of all national-forest land adapted to grazing consistent with the protection of other important uses of the land, 2. The permanent good of the livestock industry through proper care and improvement of the grazing lands, 3. The continued stability of the established ranch owners using the range.

As estimated in 1948, reductions proposed for 1949 and 1950 averaged about two percent per year of the total number of livestock permitted to graze on western national forests in 1947, although in some localities quotas on undergrazed tracts were increased.

Emergency Conservation Meet Arouses Discussion of Needs

At a National Emergency Conservation Conference on May 12-14 which was called by the Public Affairs Institute various proposals were made for securing more effective conservation of renewable resources.

Featured speakers included Charles F. Brennan, Secretary of Agriculture; Bevier Show, F.A.O.; Herman Pritchett, University of Chicago; Herbert Broadley, F.A.O.; Earle Clapp; Ellery Foster; Dewey Anderson; Charles Kellogg, Division of Soil Survey, U.S.D.A.; Marion Clawson, Bureau of Land Management; William Voigt, Jr., Izaak Walton League; A. F. Whitney, Brotherhood of Railroad Trainmen; William Vogt; Charles Hardin; James H. Rowe, Jr., member of the Hoover Commission; Stephen Raushenbush, author of "Our Conservation Job"; and others.

Attended by 50 to 200 persons, the conference served to arouse discussion of conservation problems needing solution.

Crossett Blue Proves Best

A mixture of one-sixth of a pint of Prussian Blue oil color to one gallon of outside white paint has proved to offer the most contrast with the bark of both pine and hardwood trees when used for boundary-line marking.

Named Crossett Blue, the mixture was developed at the Crossett Experimental Forest in Arkansas. Colors in general use for marking trees show up well on pine but not hardwood, and vice versa, but the new color can be distinguished at a considerable distance in the woods when used on any species.

Parks Built on Tree Farm

Five park areas adjacent to the Spirit Lake highway which passes through its St. Helens Tree Farm in Washington are being developed for public use by Weyerhaeuser Timber Company.

Equipped with tables and fireplaces, the parks are on wooded areas accessible by automobile and with streams running next to them.

This recreational development is in recognition of the multiple use possibilities of tree farm land.

Staypak Promises White Fir Market

Staypak, a compressed wood that is tenfold harder and stronger than original wood and which is resistant to chemical attack and abrasion, has been perfected by the Western Pine Association Laboratory in Portland, Ore.

Staypak differs from other hardboards made of compressed wood fibers in that it is the result of compression of a whole board down to approximately one-third of its original thickness. The natural wood grain is retained and the board comes from the press with a natural high gloss.

The exceptional hardness of Staypak—its specific gravity is 1.35—together with flame and moisture-resistant qualities, make it an ideal material for flooring paneling, bar and table tops, tool and knife handles, bearings, shuttles, furniture, bowling alleys and signs. A multitude of other uses are expected to develop when commercial manufacture is started.

Staypak can be produced from nearly any softwood of low resin content. Experiments conducted with white fir, a lumber species in plentiful supply throughout the western states, have been outstandingly successful. Engelmann spruce and western redcedar can also be used.

Initial work on Staypak was done at the Forest Products Laboratory in Madison, Wis., but the problem of end and edge expansion after pressure had been removed prevented its economical manufacture. At this stage the project was taken on by the Western Pine lab where a press was ultimately developed to prevent the moisture loss during compression which caused the boards to later pick up atmospheric moisture and expand after release.

Lab engineers describe the process by which Staypak is made as essentially one of compression and heat. A board is subjected to a pressure of 1500 pounds per square inch at a temperature of 325 degrees Fahrenheit within the press. It remains there for a relatively short time.

No bonding agent is used to hold the board to its compressed size. The natural lignin in the wood flows under heat and acts as the cementing agent. Once pressed, the board will not lose its shape under subsequent moisture or atmospheric conditions.

A piece of Staypak feels as hard and heavy as a smooth piece of slate. Any mark or design cut into the wood before pressing is still visible although not perceptible to the touch after processing.

Staypak can be installed by gluing or with screws inserted through pre-bored holes. Metal-cutting or carbide tools are used to shape it.

Jammer Has Hinged Skids

Jammers that can be slid from place to place by means of skids are used for decking logs along roads and for loading trucks, sleighs

and railroad cars in the Lake States, but are seldom encountered elsewhere, according to E. W. Fobes of the Forest Products Laboratory at Madison, Wis. Such jammers, because of their simplicity, low cost, ease of construction, and efficiency are especially suitable for small operators, and particularly for farm woodlot owners, he says.

They consist of a substantial timber base and boom structure, with cable, blocks, and guy lines. The base consists of two skids with cross bunks and necessary bracing. Boom structures mounted on the sliding bases vary to suit the individual needs.

In the method illustrated the legs are fastened to the ends of the bunks by heavy iron hinges. This is known as a tip-up jammer because when it is set up the skid is tipped up against the legs leaving the road clear for trucks and sleds. Steel pins projecting from the bottom of the legs help to increase their stability when resting on the ground. When moving the jammer, the A-frame is supported by a detachable leg.

Two guy lines from the top of the mast or A-frame are secured to stumps or trees.

Power to pull the cable is derived from a variety of sources. Teams are commonly used, but other sources include farm tractors, logging tractors with winches, trucks, and hoists.

Versene Ensures Uniform Kill

Difficulties in securing uniform results from the use of 2,4-D is frequently caused by variations in the hardness of the water used when spraying the weed-killer. A sludge which often clogs spray nozzles also forms if water is hard.

To alleviate these conditions the Bersworth Chemical Company, Framingham, Mass., has developed a hard water testing kit and a water conditioner called Versene, which when added to the 2,4-D solution will ensure lethal results uniform with test data obtained at experimental stations.

Hoskins Gets Sixth FFA Award

Robert N. Hoskins, industrial forester for the Seaboard Air Line Railroad Company, was awarded the Honorary State Farmer Degree in the Virginia Association of Future Farmers of America at their state convention on June 22 at Blacksburg.

He had previously been awarded the honorary degree in the five other states of his territory: North Carolina, South Carolina, Georgia, Florida, and Alabama.

Drop Glacier View Dam Plans

Construction of the proposed Glacier View dam in Glacier National Park has been eliminated from present plans for the development of the Columbia River basin, according to a joint report issued by the Secretary of the Army and the Secretary of the Interior. The project, if completed, would have inundated 20,000 acres of land in the national park.

Foresters Receive Awards For Their Superior Service

Individual Superior Service Awards were presented to several foresters by the Department of Agriculture on May 16, at Washington, D. C. Principal speakers at the ceremony honoring outstanding U.S.D.A. employees were Senator Elmer Thomas of Oklahoma, chairman of the Senate Committee on Agriculture and Forestry, and Charles F. Brennan, Secretary of Agriculture.

Among those honored were:

George M. Byram, Forest Service, Asheville, N. C., for outstanding research achievements leading to the development of haze meters, eyesight tests, a haze cutter, other detection aids, a fuel moisture scale, and special instruments to facilitate forest research; for creating a better understanding of the principles of visual resolving power and visibility measurement; and for his understanding of solar and terrestrial radiation effects on forest inflammability;

Virgil R. Carrell, Forest Service, Estacada, Oreg., for his outstanding and skillful administration of an exceptionally heavy and complex ranger district;

Walt L. Dutton, Forest Service, Washington, D. C., for outstanding service to public welfare through effective administration and leadership in the field of range management, resulting in critically needed improvement of range lands in the National Forests with respect to forage, water run-off, and soil conservation;

Edward C. Groesbeck, Forest Service, Williams, Ariz., for unusual initiative and aggressiveness and for superior accomplishment in the administration of timber-management, land-exchange, and recreation activities assigned to him on the Kaibab National Forest;

Simon Strickland, Forest Service, Albuquerque, N. Mex., for aggressive leadership and superior skill and resourcefulness in placing large areas of valuable high water-yielding forest land under the protection and management necessary for them to produce the maximum benefits for people living in Southwestern United States;

Anthony W. Thomas, Forest Service, Juneau, Alaska, for outstanding voluntary services in spite of danger from snow and rock slides in searching for, discovering, and bringing out from precipitous Mount Juneau the body of a mountain climber who had been killed and buried in a snow slide; and

Fred B. Trenk, Extension Service, Madison, Wis., for exceptional ability and ingenuity in conducting effective educational programs on farm forestry and related land use problems.

Norwegian Technician Studies American Pulp, Paper Methods

United States equipment and methods used in the production of pulp and paper will be studied by Capt. Borre Morch, assistant mill manager of Follum Fabriker, a Norwegian paper mill, during a three to four months' visit, starting about August 15. He is interested in studying the use of liquid sulphur dioxide in chemical pulp production, bleaching processes, barking and handling of logs, and modern types of paper printing machines, calendars, screens, and beaters.

Capt. Morch's trip, as well as visits to the United States by technicians in other fields, have been approved under the Economic Cooperation Administration's program for providing technical assistance to countries participating in the European Recovery Program.

Census Bureau Reports 1947 Lumber Production

Lumber production in the United States during 1947 is reported at 35,404 million feet by the Bureau of the Census. Its estimates are based on the census of manufactures taken in that year. A preliminary industry report on sawmills and planing mills was released on May 16. Information from 19,039 establishments producing over 200 M feet b.m. of lumber annually was included.

The value added by manufacture was estimated at $1,476,500,000. Average number of production and related workers was 363,673 who earned $683,700,000.

Value of products shipped was $2,501 million in 1947, an increase of 259 percent over that in 1939.

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Newest, most compact model in the famous line of Pacific portable pumpers, proved in years of use by public and private forest fire protection agencies.

Power plus portability! The new light weight Model 5-A is easily transportable on foot, by truck or by air. Offered with choice of two pumps for volume up to 32 g. p. m. or for pressure up to 275 p. s. i.

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Standard Fire Developed

Fire researchers at the California Forest and Range Experiment Station in studying the use of wetting agents have developed a "standard fire." The fire gives burning conditions that can be duplicated at will, essential for conclusive data. Fuel of specified type is fixed to a rotating ring and ignited by a controlled gas flame. At the proper time water, with or without wetting agent, is applied systematically from a nozzle inside the ring. W. L. Fons, in charge of the "merry-go-round," says the operation is highly efficient and eliminates bias due to personal judgent in the old fashioned "non-standard" fires.

Bjorge Joins Tree Group

Wilson Bjorge has joined the staff of Trees for Tomorrow, Inc., as forester and manager of the camp at Eagle River, Wis. A 1940 Iowa State College forestry graduate, he replaces W. S. Corlett who resigned to enter the teaching profession.

MRS. FERDINAND SCHMITZ of Seattle, mother of Henry Schmitz, accepts on behalf of her son a distinguished service scroll which the University of Washington Foresters Alumni Association awarded May 21 to the noted alumnus of the class of 1915. Dr. Schmitz could not be present at the annual spring meeting of the group at Pack Demonstration Forest near Lagrande, Wash., so his mother consented to act for him. At right is Mrs. Harold H. Hartman, Seattle, sister of Dr. Schmitz. Presenting the scroll is Edgar J. Murnen, Tacoma, class of 1913; while looking on from left is Gordon D. Marckworth, dean of the College of Forestry.

At commencement exercises in June, the University of Washington made Dr. Schmitz "Alumnus Summa Laude Dignatus," the highest honor that it can bestow on a graduate.

Dr. Schmitz is dean of the College of Agriculture, Forestry and Home Economics at the University of Minnesota.

Bernard L. Orell Appointed Washington State Forester

Bernard L. Orell has been appointed State Supervisor of Forestry in the Washington Department of Conservation and Development at Olympia. He succeeds T. S. Goodyear who had been state forester since 1933.

An Oregon State College graduate, Mr. Orell has had experience with the U. S. Forest Service, the Oregon State Board of Forestry, and most recently as an instructor at the University of Washington School of Forestry.

Forest Recreation Increases

Over 27,000,000 individuals are expected to visit recreational areas in National Forests this year, according to the U. S. Forest Service, which has developed 4,500 camp and picnic areas, 230 winter sports areas, and 400 organization camps.

Special accommodations are provided for vacationists by 500 resorts which are under special permit, and some 14,000 summer homes have been built on selected areas of the 151 national forests.

Largest increases in use in 1948 over that in 1947 were on winter sports areas and picnic areas.

A total increase of over 13 percent, which was recorded last year, is anticipated this year.

Georgia Forester Resigns

A. Ray Shirley, Director of the Georgia Forestry Commission has resigned to accept a position with the Turpentine Producers Association at Valdosta, Ga.

Prior to becoming state forester in 1947, he had served as cooperative agent in naval stores with the Georgia Agricultural Extension Service.

Costley Supervises Allegheny

Richard J. Costley succeeded Alfred H. Anderson as forest supervisor of the Allegheny National Forest on July 1. Anderson was transferred to a similar position on the Monongahela National Forest where he will succeed Arthur H. Wood who is retiring after 30 years with the Forest Service.

Costley was formerly assistant chief in the Wildlife Management Division of the Forest Service at Washington, D. C.

Wooley Joins Pacific Loggers

Carwin Wooley has been appointed assistant to Secretary-Manager A. Whisnant of the Pacific Logging Congress, Portland, Ore.

Swedish Increment Hammer Indicates Current Growth

Practical tests in Canada and Sweden have demonstrated the value of increment hammers in obtaining information regarding current growth of trees. Expected to replace the conventional increment borer as an aid in selecting trees to be marked and in making estimates of the response of residual stands to cutting, speed and ease of operation have been paramount factors in establishing the popularity of this tool.

The Swedish increment hammer is illustrated in this issue of the JOURNAL in the advertisement of the Sandvik Saw & Tool Corporation, 47 Warren Street, New York 7, New York, distributors for this and other Swedish foresters' tools which are described in a catalog available from the company.

Used very much like an ordinary carpenter's hammer, the cutting bit is driven into the tree by the impact of the weighted head. The resultant core, approximately ¾" in length is then extruded through the nose of the bit by pushing on the extractor after the tool has been removed from the tree. The Increment Hammer can be used on frozen wood as well as on thick barked trees. It weighs 13 ounces and is 10 inches overall in length. It is equipped with a comfortable wooden handle, and extra cutting bits are obtainable in the event the original cutting bit is broken or damaged. The handle of the tool is mounted in an oblique position relative to the borer which is intended to facilitate entrance of the borer from the side perpendicularly to the tree.

Poulton Heads Range Research

Charles E. Poulton has been appointed to succeed Dr. William C. Weir, resigned, as head of range management teaching and research at Oregon State College and the Agricultural Experiment Station. He is assigned to both the Departments of Animal Husbandry and Farm Crops.

Mr. Poulton has had training and experience at the University of Idaho, Montana State College, State College of Washington, and with the U. S. Forest Service.

STOP THAT FIRE
Ranger Pal Fire Plow

The "Ranger Pal" is a hand mechanically operated middle-buster with coulter, plow. Drawbar connection has three elevation heights, built of 1" steel. An 18" coulter is mounted ahead of middle-buster and will cut a 4" root. One 20" harrow disc is mounted on a "wing" to each side of middle-buster turning the sod over and out. Two 8-inch wheels, complete with 4.00-8 tires are independently suspended for stump clearance, and may be retracted through 90 degrees from true vertical (down) to horizontal (aft), by a ratcheted hand lever atop plow. The action of lever on wheels effects depth of plowed line and when in stowed position allows plow blades at least 3" clearance over ground. Plow leaves a 6-foot raw earth line and may be pulled by any light Cletrac HD-5 or similar tractor. Satisfied users will acclaim effectiveness. Mass production price at $450.00 each, f.o.b. shop. Fully guaranteed.

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Designed for quick, easy examination of bark and recent tree growth. Use like a hammer and extract ¾" core *instantly*. A time-saver in selective cutting operations.

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OPERATE TREE FARMS—to provide a never ending timber supply for our mills. The forest crop is harvested, reseeds, harvested, reseeds—in about 80-year cycles.

DIVERSIFY OUR MANUFACTURING—in order to use all of the tree. The aim is to build manufacturing centers in each of our operating areas so that on one millsite we can make useful products from low value as well as high value material.

DEVELOP NEW PRODUCTS—to increase the "take" from each acre of forest land harvested. A staff of engineers and scientists spend all of their time in this work. More products mean more steady jobs.

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Start buying Bonds today!

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FORESTER WANTED

To work on a conservation tree farm located near Cockeysville, Maryland. Must be handy with wood working tools, physically capable of outdoor work. Pleasant modern house, chicken yard, garden, in beautiful forest surroundings. Permanent position, with increasing possibilities, for right man and family. Give age, education, experience, size of family, other pertinent data.

Write: H. Lee Hoffman, Ivy Hill Forest, Cockeysville, Maryland.

JUST OUT ***$3 postpaid***

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Over 400 pages of up-to-date information on every phase of forestry, completely indexed and cloth-bound, 6 by 9 inches.

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SOCIETY OF AMERICAN FORESTERS
Mills Building
17th Street and Pennsylvania Avenue
WASHINGTON 6, D. C.

POSITION WANTED

Cornell Graduate, BSF in 1935, MF in '36. Six years with U. S. Forest Service. Three and one-half years saw-milling officer Army Engineer Forestry Company. Three years private logging. Desire permanent position with forestry minded company either as full time forester or a combination of forester and other duties which will utilize the above experience. References and details on request. Northeast preferred.

Box F, Journal of Forestry, Mills Building, Washington 6, D. C.

POSITION WANTED

Syracuse graduate, B.S. in 1915, M.F. in 1916. Also correspondence course in Business Administration. Over 20 years of logging experience in Canada and Newfoundland and about 10 years of forestry experience in various parts of Canada, United States, and Mexico. Desires either permanent or temporary position in forestry or logging or a combination of both. References and details forwarded on request.

Box H, Journal of Forestry, Mills Building, Washington 6, D. C.

For Members and Guests of the Society of American Foresters. This Attractive Trip Has Been Arranged to Seattle Convention Oct. 11-13, 1949

Seattle—gateway to Alaska and the Orient, husky and fast-growing metropolis of the Evergreen Pacific Northwest—welcomes the Society of American Foresters next October.

Combine business with education and pleasure and join your officers and other members for these trips, which are arranged especially for you. Consulting with your headquarters, and also Northwest members, we planned trip "A" so that you will arrive in good season for the opening session, and after convention you return home via any route. And for others (not members of "A" party) trip "B" will operate immediately after convention. Under this program, you will enjoy the maximum privileges of diverse routings you are entitled to receive from your railroad tickets.

Enroll for these trips:—Your companions will be congenial and your traveling budget will be used to the very best advantage.

"A"

Group 1 will leave Chicago Oct. 6, Union Station, CB&Q, at 11:00 p.m. Lv. St. Paul 8:00 a.m. Oct. 7. Tour *Yellow-Stone Park* all day Oct. 8.

Group 2 will leave one day later than Group 1: namely, Lv. Chicago Oct. 7, 11:00 p.m., St. Paul Oct. 8, 9:00 a.m. joining Group 1 in Montana Oct. 9.

Foresters will join the party en route along the **Northern Pacific,** at Minneapolis, Staples, Bismarck, Billings, Butte, Helena, Missoula, and Spokane.

Ar. Ellensberg, Wash., 3:31 a.m. Oct. 10 (Sleepers set out for occupancy). Here the "Yakima Tree Farm" on the eastern slope of the Cascade Mts. will be inspected. Sponsored by the **N.P.Ry.,** with counsel from federal and state experts, this project in conservation and reforestation is outstandingly interesting.

Sightseeing buses motor us over the magnificent scenic Cascades, arriving Seattle for dinner Oct. 10.

Group 1 cost will be $21, including Yellowstone Park and Cascade Mt. sightseeing. Group 2 cost will be $6.00. Federal taxes included.

Normally Yellowstone Park is not open at this time of the year. This is an especially arranged trip.

"B"

After convention, our "B" party will leave King St. Station, Seattle, at 10:00 p.m., Oct. 13 via Northern Pacific's North Coast Limited. All day in American Rockies, with arrival Livington, Montana 10:25 p.m. Oct. 14. Room with bath Livingston Hotel. Tour through Yellowstone to Old Faithful Geyser Basin—200 miles of wonderful national park scenery on Oct. 15. Autumn colors, many wild animals — a memorable out-of-the-ordinary adventure. Lv. Livingston 10:35 p.m. Oct. 15. Arrive Minneapolis 9:25 p.m. on Oct. 16 and Chicago at 7:45 a.m. Oct. 17.

The "B" trip will be $15 for Yellowstone sightseeing tour—one-third the summertime cost.

Questions? Write us for exact schedules and costs from your home city. We'll save you time and money. Our planning service is helpful and free to you.

Example Fare: Roundtrip, Chicago-Seattle, $154.48 per person including federal taxes and one-half double bedroom; or $120.10 tourist class, including taxes and one-half section. Take your lady to See America First!

For information, please write M. M. Goodsill, C.P.A., Northern Pacific Ry., St. Paul 1, Minnesota.

New McGRAW-HILL Books

HARVESTING TIMBER CROPS

By A. E. Wackerman, Duke University. *American Forestry Series.* 437 pages, $5.00

A text covering all phases of harvesting, from preliminary considerations involved in planning and preparing for the actual harvesting steps, to cost controls and records. The final chapter, devoted to regional harvesting practices, was prepared by seven contributors, each an expert in his region. The subject of timber harvesting is treated as an integral part of forestry, rather than as an independent procedure. The author covers the harvesting of all important forest products such as saw logs, pulpwood, poles, ties, and veneer blocks. Throughout, the treatment is more analytical than descriptive. The illustrations are outstanding.

FARM WOOD CROPS

By John F. Preston, formerly chief of Forestry Division, Soil Conservation Service, U. S. Department of Agriculture, Washington, D. C. *American Forestry Series.* Ready for fall classes.

A textbook for usual courses in farm forestry in colleges of agriculture. Employs a direct and practical approach and does not treat dendrology and silviculture from an academic point of view. It is a technical guide to the development of a farm woodland enterprise integrated with the farm business and presents the farm economic angles of forestry and the forestry techniques needed in the initial stages of woods management. It shows why the farmer should grow wood as a farm crop, and, after he has decided to do it, how to take the first steps in farm woodland management.

FOREST INFLUENCES

With Special Emphasis on Basic Economic Problems

By Joseph Kittredge, University of California. *American Forestry Series.* 415 pages, $4.50

Brings together for the first time the widely scattered information on the value of forests and shrubs as a protective covering for the land, analyzing their basic physical relations to climate, water, and soil, and evaluating their usefulness and the possibilities in their management for the reduction of floods and erosion and the production of maximum yields of usable water.

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Here, in one convenient volume, is an extraordinarily comprehensive guide to natural history. This fieldbook embraces birds, fish, plants, rocks and minerals, the stars, mollusks, reptiles, and mammals—more than 2,000 items and hundreds of pictures arranged and tabulated for easy reference. Each item has its descriptive identification, followed by data on range and location, life history, ecology, and economic importance. Common names, illustrations, and technical classifications are given for each item in this book

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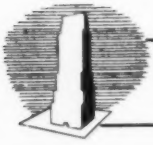

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